I.1
11/30/98

LETTER REPORT
FOR
SANYO SITE
RICHMOND, WAYNE COUNTY, INDIANA
TDD: S05-9804-002
PAN: 8A0201SIXX

November 30, 1998

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Emergency Response Branch
77 West Jackson Boulevard
Chicago, Illinois 60604

Prepared by: Brendan O. McLennan for RB Date: 11/30/98
For Ronald W. Bugg, START Project Manager

Reviewed by: Mary J. Ripp Date: 11/30/98
M. J. Ripp, START Assistant Program Manager

Approved by: Date: 11/30/98
Thomas Kouris, START Program Manager

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ecology and environment, inc.
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November 30, 1998

Gail Nabasny
Emergency Support Section
United States Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: Sanyo Site
Richmond, Wayne County, Indiana
TDD: S05-9804-002
PAN: 8A0201SIXX

Dear Ms. Nabasny,

The United States Environmental Protection Agency (U.S. EPA) tasked the Ecology and Environment, Inc. (E & E), Superfund Technical Assessment and Response Team (START) under Technical Direction Document (TDD) S05-9804-002 to assist U.S. EPA On-Scene Coordinator (OSC) William Simes in conducting a site assessment at the Sanyo site in Richmond, Wayne County, Indiana (Attachment A, Figure 1). The site assessment included developing a site safety plan; collecting background information from present operators of the facility, the Indiana Department Environmental Management (IDEM), and the Indiana State Department of Health (ISDH) Indoor and Radiological Health Division; conducting a reconnaissance of the areas of concern; conducting gamma radiation monitoring; collecting samples to be analyzed by the U.S. EPA National Air and Radiation Environmental Laboratory (NAREL); and generating a Letter Report.

The Sanyo facility was erected in 1935 and was initially owned by Crosley (AVCO). AVCO produced grenades, small arms, guidance mechanisms for polarized missiles, and gun sights under military contracts. Some of the material contained radioactive metals. The plant had also manufactured televisions and automobiles. AVCO sold the facility to Design and Manufacturing (D&M) in the mid-1970s. The facility was separated into two groups: D&M and Absocold Corporation. D&M manufactured 18-inch dishwashers and porcelain fixtures, and Absocold Corporation manufactured small refrigerators. In March 1986, Sanyo Corporation purchased the property from D&M under a copyright infringement agreement.

Several environmental inspections were conducted at the facility from the mid- to late-1980s by IDEM and Indiana Land Pollution and Control, pertaining to spills that were reported by D&M, discharges of liquids into the local creek by D&M, and disposal of material on site. On May 8, 1988, IDEM conducted a preliminary assessment (PA). IDEM requested the assistance of U.S. EPA and a screening site inspection was conducted by Roy F. Weston, Inc., in August 1992.

The Nuclear Regulatory Commission (NRC) had an ongoing project to review terminated license files. The goal of the review was to determine whether formerly licensed activities may have ceased operations without full verification and documentation that any residual radioactivity was within the guidelines for release for unrestricted use. The NRC conducted an inspection at the Sanyo property on June 4-6, 1997. NRC was accompanied by ISDH, IDEM , and U.S. EPA representative Larry Jensen.

Based on the results of the inspection, the NRC determined that no radioactivity from licensed materials was distinguishable from background radiation. Therefore, NRC had no further regulatory interest in the Sanyo site. During the inspections, elevated levels of naturally occurring radioactivity were identified from naturally occurring radioisotopes of the uranium and thorium series, and potassium-40 which were contained in coal/fly ash. The coal/fly ash was generated during the operation of on-site boilers from 1937 to 1989, and was widely distributed on the site. The concentrations of radioactive materials were up to 15 picocuries per gram (pCi/g) of both uranium and thorium, and 10 pCi/g of potassium-40.

On May 5, 1998, OSC Simes, U.S. EPA representative Jensen, IDEM representative Angelo Dattilo, ISDH representatives Rex Bowser and Jane Smith, along with START member Ron Bugg, met with Wayne County Emergency Response Management Director Fred Griffin and Sanyo Plant Manager Carla Maurer to discuss the elevated levels of radioactivity discovered at the northern section of the facility. OSC Simes and U.S. EPA representative Jensen informed the plant manager of the NRC report; U.S. EPA involvement in the site; the initial stages of the site assessment; and the possible actions that may occur, pending radiation monitoring and sample results. START Bugg conducted a preliminary radiological survey of the areas of concern using a sodium iodide single channel analyzer and a microRoentgen meter. U.S. EPA representative Jensen, along with ISDH, began collecting a global positioning system (GPS) radiological survey of the site.

On June 16, 1998, OSC Simes, U.S. EPA representative Jensen, along with START members Bugg and Brendan McLennon, met with ISDH to collect soil samples from different depths, and conduct radiological borehole logging at depths of six feet at nine separate locations throughout the site. START was also instructed to collect sediment and surface water samples from a pond and creek at a neighboring park. The site safety meeting was held and the hazards of the site were discussed.

The sampling group included the OSC and the START members. U.S. EPA representative Jensen, along with ISDH, continued the GPS survey. U.S. EPA representative Jensen marked each location to sample and auger. U.S. EPA representative Jensen requested that duplicate samples be collected and analyzed by ISDH. The sample locations were labeled as SS1 to SS9. Four samples were collected at each location, two for U.S. EPA and two for ISDH. The samples were collected at depths of 1 and 2 feet. After the sampling was completed at each location, the sampling group augured a hole at a depth of 6 feet so that radiological borehole data could be obtained.

After the second group completed the GPS survey of the site, U.S. EPA representative Jensen conducted borehole logging of each location using a sodium iodide probe. Due to the density of and the dampness of the soil/fly ash, the holes were collapsing at depths of approximately 3 to 4 feet. The sampling group was delayed for approximately one hour due to inclement weather. After the sixth sample location was completed, the sample group decided to complete the remaining boring manually using a post-hole digger.

After collecting samples from the nine locations, the sampling group collected a sediment sample (SED-1) and two surface water samples (SW-1 and SW-2) from the neighboring Springwood Park (Attachment A, Figure 2). The surface water samples were collected from Springwood Lake and West Fork Whitewater River. After the U.S. EPA provided ISDH with the duplicate samples (18 soil samples, two surface water samples, and one sediment sample), the groups departed the site.

On June 17, 1998, START member Bugg packaged the samples for shipment to NAREL in Montgomery, Alabama, and the samples were analyzed for gross alpha, gross beta, and gamma nuclides (Attachment B). The sample results were sent to U.S. EPA representative Jensen. In October 1998, START member Bugg received the results to review and incorporate into table form for the letter report (Attachment C).

The primary areas of concern were identified to be at sample locations SS2 and SS7. Sample

SS2-1A, located north of the facility where the fly ash was dumped, had elevated radium-226 levels of 21.5±0.9 pCi/g at 12 inches below the surface. Sample SS2-2A had elevated radium-226 levels of 17.6±0.7 pCi/g at two feet below the surface. Samples SS7-1A and SS7-2A were located near the buildings on the western section by the boiler. Sample SS7-1A, collected at a depth of 1 foot below the surface, had an elevated radium-226 level of 11.6±0.7 pCi/g, and sample SS7-2A, collected at a depth of 2 feet, was 10.9±0.5 pCi/g. Depending on the location of where the samples were collected, the average background for radium-226 ranged from approximately 2 to 8 pCi/g.

There are three possible scenarios to address the areas with elevated radiation levels. Assuming the areas of concern include between 5,000 and 10,000 cubic yards, cost estimates were determined for each scenario (Attachment D).

Scenario 1. The first scenario includes excavating the areas of concern, shipping the material for disposal at $550.00 per ton, and backfilling the area with clean fill. The removal would require several track hoes and track loaders, a radiation survey crew to monitor the excavation, and disposal and backfilling activities. The work would include four weeks of excavation and backfilling with an Environmental Response and Remediation Services (ERRS) crew of approximately three operators, three technicians, one foreman, and one response manager, working 12-hour days, six days per week. The transportation and disposal (T & D) cost for 13,000 tons would by approximately $7,500,000. The total cost for ERRS to complete Scenario 1 would be approximately $10,500,000. The U.S. EPA and START costs would be approximately $52,000. The U.S. EPA cost would include using the gamma-spectroscopy unit to determine the extent of contamination in the soil. The OSC and one START member would be on site for 28 days.

Scenario 2. The second scenario includes placing a clay cap over the existing areas with elevated levels of radiation. The installation of a clay cap involves using an ERRS crew with several pieces of heavy equipment and transporting over 1,200 cubic yards of clay to the site to be dispersed over the areas of concern. The estimated time of completion of the clay cap is 15 days at a cost of approximately $156,000. The U.S. EPA and START costs would be approximately 50% less than Scenario 1. The reduced cost was due to not using the gamma-spectroscopy unit and the estimated time of completion is reduced to 15 days. The clay cap, if properly installed, would act as a shield and increase the distance from the radioactive material, which reduces the potential exposure to the radioactive material.

Scenario 3. The third scenario includes determining the background levels outside the areas of concern and subcontracting a fencing company to install over 1,000 linear yards of 6-foot-high chain-link fence at an appropriate location. The fence would be installed outside the areas of concern that measure at or below background limit of 5 to 10 pCi/g or 6 to 10 microRoentgens per hour (mR/hr) using a microR meter. Scenario 3 would restrict access to areas with elevated levels of radioactivity. By increasing the distance from the radioactive material, the exposure levels are limited. The cost of installing the fence is estimated at approximately $87,000. Presently, there is fencing on the southern section of the site, limiting the access to the areas from the public.

Although Scenario 1 removes the radioactive metals, Scenarios 2 and 3 are the most cost-effective solutions to limiting exposure to the elevated levels of radioactive material.

This report completes the requirements of the TDD. If you have any questions or require additional information, please contact our office at (312) 578-9243.

Sincerely,

Brendan P. McLennan for RB

for Ronald Bugg
START Project Manager

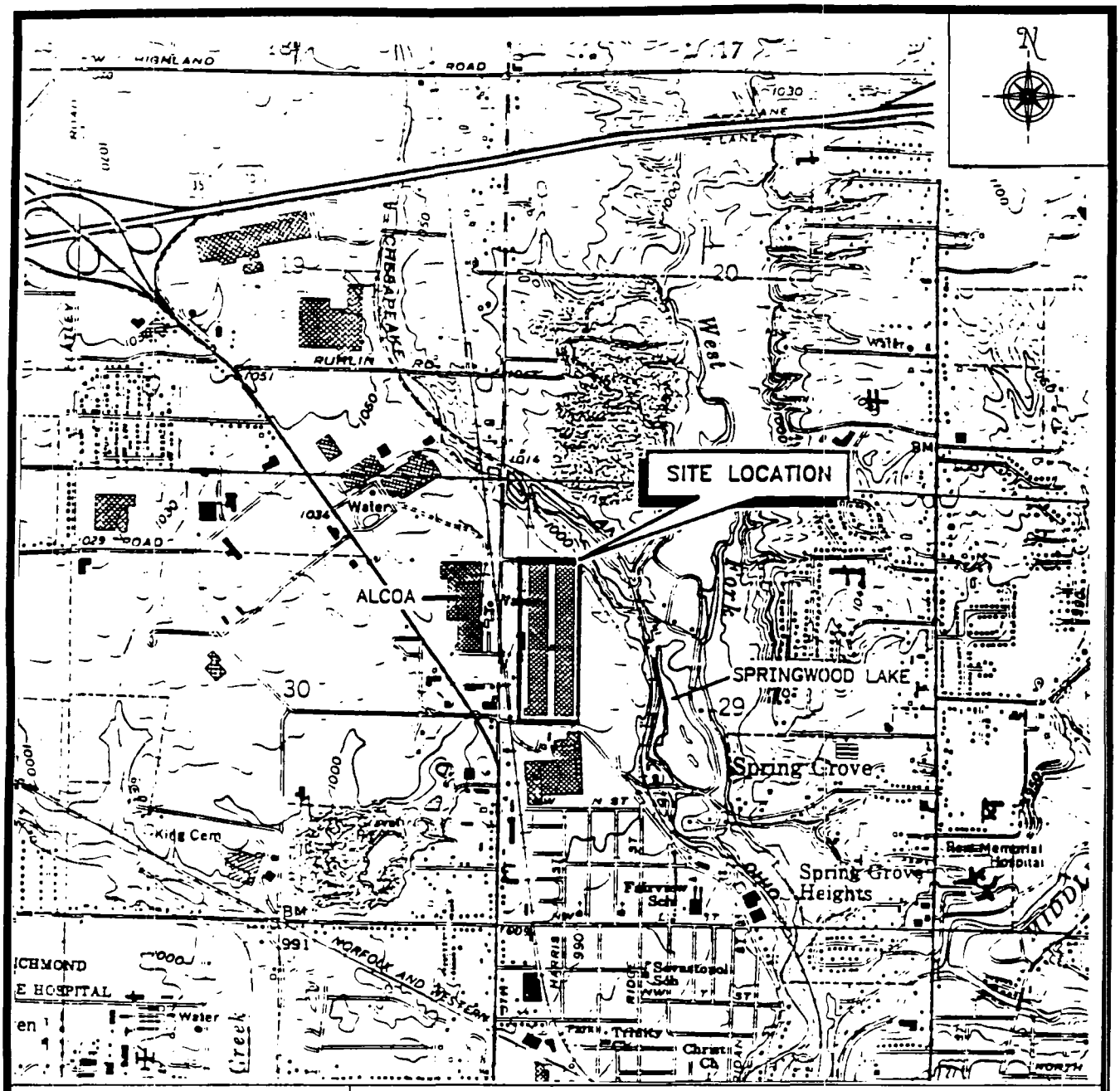
Thomas Kouris
START Program Manager

Attachments: A - Figures
B - Analytical Results (NAREL)
C - Tables
D - Cost Projections
E - Photodocumentation

cc: William Simes, U.S.EPA, OSC
START File

Attachment A

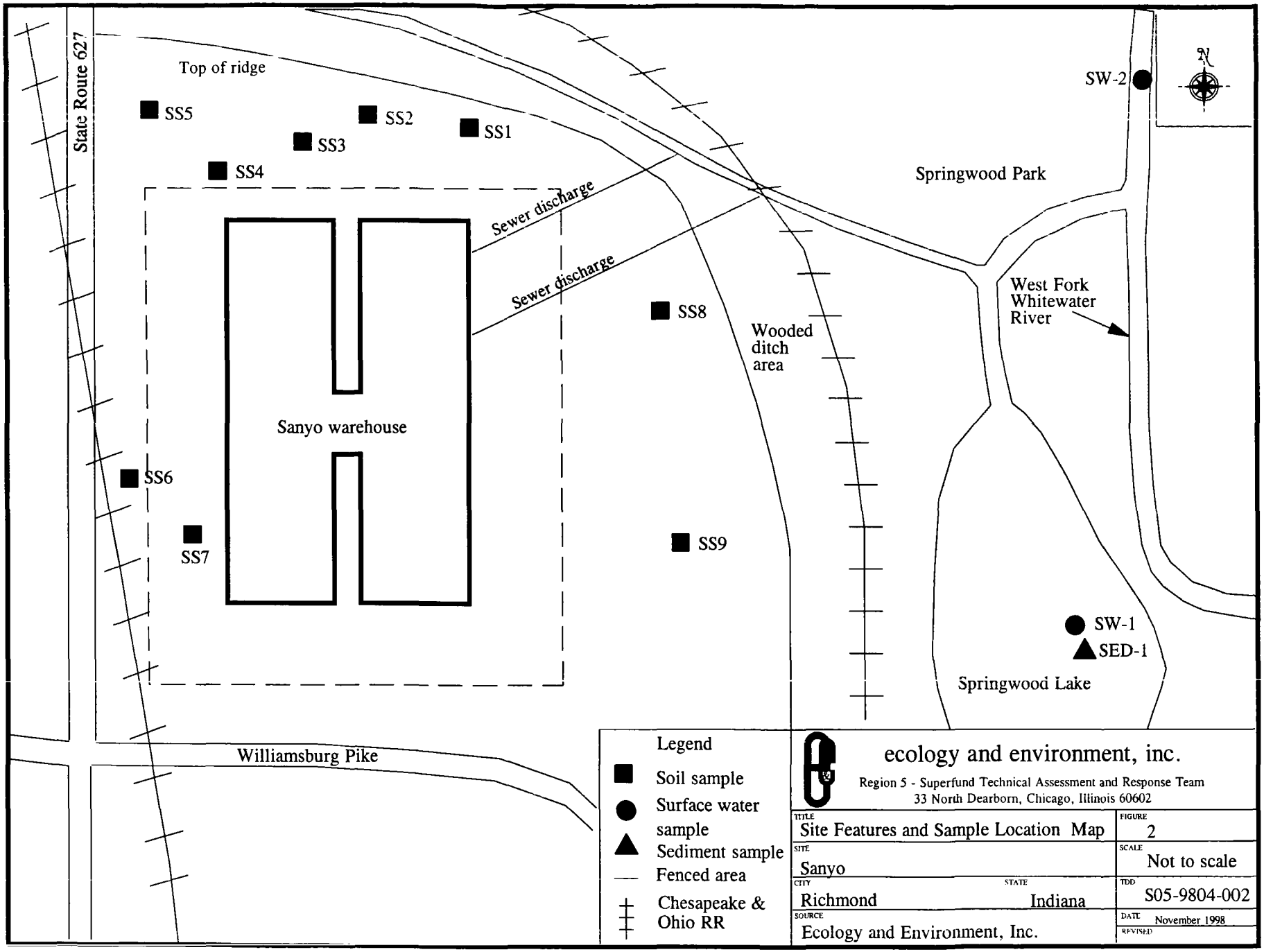
Figures



Quandrangle Location

ecology and environment, inc.
Superfund Technical Assessment And Response Team
Region 5
33 North Dearborn Street, Chicago, Illinois 60602

TITLE	Site Location Map	FIGURE	1
SITE	Sanyo	SCALE	1:24,000
CITY	Richmond	STATE Indiana	PAN S05-9804-002
SOURCE	U.S.G.S. Topographical Map, Richmond, Indiana Quadrangle, 7.5' Series	DATE	1962
		REVISED	


State Route 627
Top of ridge
SS5
SS2
SS1
SS3
SS4
Sewer discharge
Sewer discharge
Sanyo warehouse
SS6
SS7
SS8
SS9
Wooded ditch area
SW-2
Springwood Park
West Fork Whitewater River
SW-1
SED-1
Springwood Lake
Williamsburg Pike
N
Legend
Soil sample
Surface water sample
Sediment sample
Fenced area
Chesapeake & Ohio RR
ecology and environment, inc.
Region 5 - Superfund Technical Assessment and Response Team
33 North Dearborn, Chicago, Illinois 60602
TITLE Site Features and Sample Location Map
FIGURE 2
SITE Sanyo
SCALE Not to scale
CITY Richmond
STATE Indiana
TDD S05-9804-002
SOURCE Ecology and Environment, Inc.
DATE November 1998
REVISED

Attachment B

Analytical Results (NAREL)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 9, 1998

MEMORANDUM

SUBJECT: Radiochemical Results for
Sanyo Site samples

FROM: John Griggs, Chief
Monitoring and Analytical Services Branch

TO: Larry Jensen, Health Physicist
Region 5

Attached are data packages for gamma and gross alpha and beta analyses of sediment, soil and water samples collected from the Sanyo Site in Richmond, Indiana. The samples constitute NAREL batch numbers 98-00054, 98-00055 and 98-00056.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these six nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is

contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Jack Barnette, Region 5, w/o attachments
Mary Clark, (6601J), w/o attachments
Ed Sensintaffar, NAREL

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800054

Project: SANYO
Procedure: Gross alpha-beta
Date Reported: 09/01/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03689F	SS1-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03690Y	SS1-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03691Z	SS2-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03692A	SS2-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03693B	SS3-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03694C	SS3-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03695D	SS4-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03696E	SS4-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03697F	SS5-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03698G	SS5-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03699H	SS6-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03700G	SS6-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03701H	SS7-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03702J	SS7-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03703K	SS8-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03704L	SS8-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03705M	SS9-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03706N	SS9-2A	SAM	SOIL	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

for Edwin L. Kawamoto 9-9-91

James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98

John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity has the potential for greater analytical bias. This is especially true for solid samples. It should be noted that this potential analytical error is not included in the two-sigma counting error term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

ANALYSIS SUMMARY

Analysis Procedure: ALPBET
Title: Gross alpha-beta

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03689F		N/A	08/26/1998	0001505B	0000550T
98.03690Y		N/A	08/26/1998	0001505B	0000550T
98.03691Z		N/A	08/26/1998	0001505B	0000550T
98.03692A		N/A	08/26/1998	0001505B	0000550T
98.03693B		N/A	08/26/1998	0001505B	0000550T
98.03694C		N/A	08/26/1998	0001505B	0000550T
98.03695D		N/A	08/26/1998	0001505B	0000550T
98.03696E		N/A	08/26/1998	0001505B	0000550T
98.03697F		N/A	08/26/1998	0001505B	0000550T
98.03698G		N/A	08/26/1998	0001584T	0000550T
98.03699H		N/A	08/26/1998	0001584T	0000550T
98.03700G		N/A	08/26/1998	0001584T	0000550T
98.03700G	DUP	N/A	08/26/1998	0001584T	0000550T
98.03701H		N/A	08/26/1998	0001584T	0000550T
98.03702J		N/A	08/26/1998	0001584T	0000550T
98.03703K		N/A	08/26/1998	0001584T	0000550T
98.03704L		N/A	08/26/1998	0001584T	0000550T
98.03705M		N/A	08/26/1998	0001584T	0000550T
98.03706N		N/A	08/26/1998	0001584T	0000550T

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03689F	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.680e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	73.54 %	Analyst:	MFW
Ash/dry weight:	89.67 %	QC type:	ANA

Comment: AUGER HOLE #1 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1A1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.22e+02	1.8e+01	7.1e+00	PCI/GASH	08/26/1998
Beta	5.32e+01	5.8e+00	5.5e+00	PCI/GASH	08/26/1998

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03690Y	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.018e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	76.72 %	Analyst:	MFW
Ash/dry weight:	88.33 %	QC type:	ANA

Comment: AUGER HOLE #1 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1A3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	7.49e+01	1.5e+01	7.2e+00	PCI/GASH	08/26/1998
Beta	4.25e+01	5.2e+00	5.0e+00	PCI/GASH	08/26/1998

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03691Z	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	8.840e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	71.35 %	Analyst:	MFW
Ash/dry weight:	88.67 %	QC type:	ANA

Comment: AUGER HOLE #2 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1A4	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.30e+02	2.0e+01	9.0e+00	PCI/GASH	08/26/1998
Beta	7.03e+01	6.9e+00	6.2e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03692A	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.940e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	70.28 %	Analyst:	MFW
Ash/dry weight:	88.67 %	QC type:	ANA

Comment: AUGER HOLE #2 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1B1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.08e+02	1.7e+01	7.2e+00	PCI/GASH	08/26/1998
Beta	6.37e+01	6.0e+00	5.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03693B	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	81.81 %	Analyst:	MFW
Ash/dry weight:	93.67 %	QC type:	ANA

Comment: AUGER HOLE #3 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1B2	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.49e+01	8.7e+00	6.8e+00	PCI/GASH	08/26/1998
Beta	2.04e+01	3.7e+00	4.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03694C	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	82.60 %	Analyst:	MFW
Ash/dry weight:	96.67 %	QC type:	ANA

Comment: AUGER HOLE #3 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1B3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.59e+01	7.4e+00	7.6e+00	PCI/GASH	08/26/1998
Beta	2.45e+01	4.0e+00	3.9e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03695D	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.002e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	82.96 %	Analyst:	MFW
Ash/dry weight:	88.33 %	QC type:	ANA

Comment: AUGER HOLE #4 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:32	100.0	T1B4	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.98e+01	7.9e+00	6.8e+00	PCI/GASH	08/26/1998
Beta	2.35e+01	3.9e+00	4.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03696E	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.008e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	87.91 %	Analyst:	MFW
Ash/dry weight:	90.00 %	QC type:	ANA

Comment: AUGER HOLE #4 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2A1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.22e+01	6.3e+00	6.2e+00	PCI/GASH	08/26/1998
Beta	1.43e+01	3.3e+00	3.8e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03697F	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001505B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.006e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	89.12 %	Analyst:	MFW
Ash/dry weight:	91.00 %	QC type:	ANA

Comment: AUGER HOLE #5 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2A2	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.61e+01	9.5e+00	8.1e+00	PCI/GASH	08/26/1998
Beta	2.08e+01	3.8e+00	4.2e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03698G	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.980e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	89.08 %	Analyst:	MFW
Ash/dry weight:	90.67 %	QC type:	ANA

Comment: AUGER HOLE #5 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2A3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.71e+01	7.7e+00	7.3e+00	PCI/GASH	08/26/1998
Beta	1.68e+01	3.5e+00	4.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03699H	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.960e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	78.34 %	Analyst:	MFW
Ash/dry weight:	89.67 %	QC type:	ANA

Comment: AUGER HOLE #6 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2A4	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.36e+01	1.0e+01	1.2e+01	PCI/GASH	08/26/1998
Beta	2.75e+01	4.3e+00	4.3e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03700G	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.920e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	79.41 %	Analyst:	MFW
Ash/dry weight:	92.33 %	QC type:	ANA

Comment: AUGER HOLE #6 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2B1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.48e+01	8.6e+00	6.7e+00	PCI/GASH	08/26/1998
Beta	2.06e+01	3.7e+00	4.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03700G	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.920e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	79.41 %	Analyst:	MFW
Ash/dry weight:	92.33 %	QC type:	DUP

Comment: AUGER HOLE #6 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2B2	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.52e+01	8.8e+00	7.2e+00	PCI/GASH	08/26/1998
Beta	2.48e+01	3.9e+00	3.9e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03701H	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.980e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	66.43 %	Analyst:	MFW
Ash/dry weight:	83.00 %	QC type:	ANA

Comment: AUGER HOLE #7 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2B3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.77e+01	1.7e+01	7.1e+00	PCI/GASH	08/26/1998
Beta	4.83e+01	5.4e+00	5.0e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03702J	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.970e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	72.77 %	Analyst:	MFW
Ash/dry weight:	83.67 %	QC type:	ANA

Comment: AUGER HOLE #7 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 10:37	100.0	T2B4	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.07e+01	1.7e+01	8.6e+00	PCI/GASH	08/26/1998
Beta	3.92e+01	5.1e+00	5.1e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03703K	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.990e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	74.45 %	Analyst:	MFW
Ash/dry weight:	85.00 %	QC type:	ANA

Comment: AUGER HOLE #8 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1A1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	5.96e+01	1.3e+01	7.1e+00	PCI/GASH	08/26/1998
Beta	3.71e+01	4.8e+00	4.7e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03704L	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.900e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	70.25 %	Analyst:	MFW
Ash/dry weight:	86.33 %	QC type:	ANA

Comment: AUGER HOLE #8 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1A3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	5.45e+01	1.3e+01	7.3e+00	PCI/GASH	08/26/1998
Beta	3.48e+01	4.8e+00	4.8e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03705M	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.003e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	82.22 %	Analyst:	MFW
Ash/dry weight:	92.00 %	QC type:	ANA

Comment: AUGER HOLE #9 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1A4	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.71e+01	8.2e+00	8.8e+00	PCI/GASH	08/26/1998
Beta	2.33e+01	4.0e+00	4.3e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03706N	QC batch #:	0000550T
Matrix:	SOIL	Prep batch #:	0001584T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.980e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	83.69 %	Analyst:	MFW
Ash/dry weight:	92.00 %	QC type:	ANA

Comment: AUGER HOLE #9 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1B1	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.48e+01	7.0e+00	7.2e+00	PCI/GASH	08/26/1998
Beta	2.34e+01	3.9e+00	4.0e+00	PCI/GASH	08/26/1998

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800054

QC BATCH SUMMARY

QC batch #: 0000550T
Preparation procedure: N/A
Analysis procedure: ALPBET

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03689F		N/A		MFW
98.03690Y		N/A		MFW
98.03691Z		N/A		MFW
98.03692A		N/A		MFW
98.03693B		N/A		MFW
98.03694C		N/A		MFW
98.03695D		N/A		MFW
98.03696E		N/A		MFW
98.03697F		N/A		MFW
98.03698G		N/A		MFW
98.03699H		N/A		MFW
98.03700G		N/A		MFW
98.03700G	DUP	N/A		MFW
98.03701H		N/A		MFW
98.03702J		N/A		MFW
98.03703K		N/A		MFW
98.03704L		N/A		MFW
98.03705M		N/A		MFW
98.03706N		N/A		MFW

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0000550T Analytical Procedure: ALPBET

LABORATORY DUPLICATES (PCI/GASH)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.03700G	ALPHA	2.48e+01 ± 8.6e+00	2.52e+01 ± 8.8e+00	1.28	0.05 OK
98.03700G	BETA	2.06e+01 ± 3.7e+00	2.48e+01 ± 3.9e+00	18.62	1.34 OK

Analyst: M Fwisdom /EH 8/31/98
Wisdom, Mary F.

QA Officer: Kirk McClure 8/31/98

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800055

Project: SANYO
Procedure: Gross alpha-beta
Date Reported: 09/01/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03707P	SED-1	SAM	SEDIMENT	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Edwin F. Hoffman 9-9-98

James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98

John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity has the potential for greater analytical bias. This is especially true for solid samples. It should be noted that this potential analytical error is not included in the two-sigma counting error term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800055

ANALYSIS SUMMARY

Analysis Procedure: ALPBET
Title: Gross alpha-beta

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03707P		N/A	08/26/1998	0001585U	0000551U
98.03707P	DUP	N/A	08/26/1998	0001585U	0000551U

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800055

SAMPLE ANALYSIS REPORT

Sample #:	98.03707P	QC batch #:	0000551U
Matrix:	SEDIMENT	Prep batch #:	0001585U
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	9.970e-02 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	85.03 %	Analyst:	MFW
Ash/dry weight:	92.67 %	QC type:	ANA

Comment: SEDIMENT SAMPLE FROM PARK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1B2	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.48e+01	7.0e+00	6.8e+00	PCI/GASH	08/26/1998
Beta	1.07e+01	3.1e+00	3.9e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800055

SAMPLE ANALYSIS REPORT

Sample #:	98.03707P	QC batch #:	0000551U
Matrix:	SEDIMENT	Prep batch #:	0001585U
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GASH	Analysis procedure:	ALPBET
Dry/wet weight:	85.03 %	Analyst:	MFW
Ash/dry weight:	92.67 %	QC type:	DUP

Comment: SEDIMENT SAMPLE FROM PARK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/26/1998 12:26	100.0	T1B3	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.24e+01	6.8e+00	7.6e+00	PCI/GASH	08/26/1998
Beta	1.25e+01	3.2e+00	3.9e+00	PCI/GASH	08/26/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #9800055

QC BATCH SUMMARY

QC batch #: 0000551U
Preparation procedure: N/A
Analysis procedure: ALPBET

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03707P		N/A		MFW
98.03707P	DUP	N/A		MFW

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0000551U Analytical Procedure: ALPBET

LABORATORY DUPLICATES (PCI/GASH)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.03707P	ALPHA	1.48e+01 ± 7.0e+00	1.24e+01 ± 6.8e+00	17.34	-0.48 OK
98.03707P	BETA	1.07e+01 ± 3.1e+00	1.25e+01 ± 3.2e+00	15.70	0.77 OK

Analyst: MFWisdom /EF 8/31/98
Wisdom, Mary F.

QA Officer: Mark McElroy 8/31/98

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800056

Project: SANYO
Procedure: Gamma spectroscopy
Date Reported: 08/24/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03708Q	SW-1A	SAM	WATER-SURFACE	06/16/1998	06/18/1998
98.03709R	SW-1B	SAM	WATER-SURFACE	06/16/1998	06/18/1998
98.03710J	SW-2	SAM	WATER-SURFACE	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 9/9/98
for James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, and U-235 are subject to greater possible error than other commonly reported radionuclides. It should be noted that this potential error is not included in the two-sigma counting error which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

ANALYSIS SUMMARY

Analysis Procedure: GAMMA
Title: Gamma spectroscopy

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03708Q		N/A	07/15/1998	0001446H	0000501H
98.03709R		N/A	07/15/1998	0001446H	0000501H
98.03710J		N/A	07/15/1998	0001446H	0000501H
98.03710J	DUP	N/A	07/15/1998	0001446H	0000501H

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03708Q	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SURFACE WATER SAMPLE FROM POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE10	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		7.4e+01	PCI/L	06/16/1998
Co60	ND		5.6e+00	PCI/L	06/16/1998
Cs137	ND		4.7e+00	PCI/L	06/16/1998
I131	ND		4.6e+01	PCI/L	06/16/1998
K40	ND		5.6e+01	PCI/L	06/16/1998
Ra226	ND		8.1e+01	PCI/L	06/16/1998
Ra228	ND		1.7e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03709R	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SURFACE WATER SAMPLE FROM POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE12	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		8.4e+01	PCI/L	06/16/1998
Co60	ND		6.1e+00	PCI/L	06/16/1998
Cs137	ND		6.0e+00	PCI/L	06/16/1998
I131	ND		5.6e+01	PCI/L	06/16/1998
K40	ND		6.3e+01	PCI/L	06/16/1998
Ra226	ND		9.9e+01	PCI/L	06/16/1998
Ra228	ND		1.9e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03710J	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment SURFACE WATER SAMPLE FROM CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:21	1000.0	GE08	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		8.9e+01	PCI/L	06/16/1998
Co60	ND		9.0e+00	PCI/L	06/16/1998
Cs137	ND		6.4e+00	PCI/L	06/16/1998
I131	ND		6.3e+01	PCI/L	06/16/1998
K40	ND		8.3e+01	PCI/L	06/16/1998
Pb212	6.40e+00	7.8e+00		PCI/L	06/16/1998
Ra226	ND		1.1e+02	PCI/L	06/16/1998
Ra228	ND		2.3e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03710J	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	DUP

Comment: SURFACE WATER SAMPLE FROM CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE01	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.4e+02	PCI/L	06/16/1998
Co60		ND		1.9e+01	PCI/L	06/16/1998
Cs137		ND		1.2e+01	PCI/L	06/16/1998
I131		ND		6.5e+01	PCI/L	06/16/1998
K40		ND		1.9e+02	PCI/L	06/16/1998
Ra226	*	6.80e+01	8.1e+01		PCI/L	06/16/1998
Ra228		ND		4.9e+01	PCI/L	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

QC BATCH SUMMARY

QC batch #: 0000501H
Preparation procedure: N/A
Analysis procedure: GAMMA

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03708Q		N/A		N/A
98.03709R		N/A		N/A
98.03710J		N/A		N/A
98.03710J	DUP	N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0000501H Analytical Procedure: GAMMA

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.03710J	BA140				
98.03710J	CO60				
98.03710J	CS137				
98.03710J	I131				
98.03710J	K40				
98.03710J	RA228				

Analyst: _____ _____

QA Officer: Kirk McEwen 9/4/98

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800054

Project: SANYO
Procedure: Gamma spectroscopy
Date Reported: 08/24/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03689F	SS1-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03690Y	SS1-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03691Z	SS2-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03692A	SS2-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03693B	SS3-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03694C	SS3-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03695D	SS4-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03696E	SS4-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03697F	SS5-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03698G	SS5-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03699H	SS6-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03700G	SS6-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03701H	SS7-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03702J	SS7-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03703K	SS8-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03704L	SS8-2A	SAM	SOIL	06/16/1998	06/18/1998
98.03705M	SS9-1A	SAM	SOIL	06/16/1998	06/18/1998
98.03706N	SS9-2A	SAM	SOIL	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 9/9/98

for James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98

John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, and U-235 are subject to greater possible error than other commonly reported radionuclides. It should be noted that this potential error is not included in the two-sigma counting error which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

ANALYSIS SUMMARY

Analysis Procedure: GAMMA
Title: Gamma spectroscopy

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03689F		N/A	07/15/1998	0001446H	0000499H
98.03690Y		N/A	07/15/1998	0001446H	0000499H
98.03691Z		N/A	07/15/1998	0001446H	0000499H
98.03692A		N/A	07/15/1998	0001446H	0000499H
98.03693B		N/A	07/15/1998	0001446H	0000499H
98.03694C		N/A	07/15/1998	0001446H	0000499H
98.03695D		N/A	07/16/1998	0000051M	0000499H
98.03696E		N/A	07/16/1998	0000051M	0000499H
98.03697F		N/A	07/16/1998	0000051M	0000499H
98.03698G		N/A	07/16/1998	0000051M	0000499H
98.03699H		N/A	07/23/1998	0000063R	0000499H
98.03700G		N/A	07/23/1998	0000063R	0000499H
98.03700G	DUP	N/A	07/24/1998	0000063R	0000499H
98.03701H		N/A	07/23/1998	0000063R	0000499H
98.03702J		N/A	07/23/1998	0000063R	0000499H
98.03703K		N/A	07/23/1998	0000063R	0000499H
98.03704L		N/A	07/23/1998	0000063R	0000499H
98.03705M		N/A	07/23/1998	0000063R	0000499H
98.03706N		N/A	07/24/1998	0000063R	0000499H

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03689F	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.850e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	73.54 %	Analyst:	N/A
Ash/dry weight:	89.67 %	QC type:	ANA

Comment: AUGER HOLE #1 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE02	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.0e+00	PCI/GDRY	06/16/1998
Bi212		6.56e+00	5.2e-01		PCI/GDRY	06/16/1998
Bi214		7.96e+00	1.2e-01		PCI/GDRY	06/16/1998
Co60		ND		8.1e-02	PCI/GDRY	06/16/1998
Cs137		ND		7.2e-02	PCI/GDRY	06/16/1998
I131		ND		6.2e-01	PCI/GDRY	06/16/1998
K40		9.01e+00	5.6e-01		PCI/GDRY	06/16/1998
Pa234m	*	8.04e+00	3.3e+00		PCI/GDRY	06/16/1998
Pb212		7.02e+00	9.3e-02		PCI/GDRY	06/16/1998
Pb214		8.38e+00	9.9e-02		PCI/GDRY	06/16/1998
Ra223		5.65e-01	1.9e-01		PCI/GDRY	06/16/1998
Ra224		4.40e+00	7.8e-01		PCI/GDRY	06/16/1998
Ra226	*	9.18e+00	7.3e-01		PCI/GDRY	06/16/1998
Ra228		6.29e+00	1.3e-01		PCI/GDRY	06/16/1998
Th234	*	6.97e+00	4.9e-01		PCI/GDRY	06/16/1998
Tl208		2.27e+00	5.5e-02		PCI/GDRY	06/16/1998
U235	*	4.20e-01	4.3e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03690Y	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.570e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	76.72 %	Analyst:	N/A
Ash/dry weight:	88.33 %	QC type:	ANA

Comment: AUGER HOLE #1 @ 1-2 FT

COUNTING INFORMATION

Date and time	*Duration (min)*	*Detector ID*	*Operator*
07/14/1998 13:37	1000.0	GE04	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		7.8e-01	PCI/GDRY	06/16/1998
Bi212		4.70e+00	4.0e-01		PCI/GDRY	06/16/1998
Bi214		5.19e+00	8.5e-02		PCI/GDRY	06/16/1998
Co60		ND		6.0e-02	PCI/GDRY	06/16/1998
Cs137		ND		6.2e-02	PCI/GDRY	06/16/1998
I131		ND		5.0e-01	PCI/GDRY	06/16/1998
K40		1.08e+01	4.6e-01		PCI/GDRY	06/16/1998
Pa234m	*	5.37e+00	2.8e+00		PCI/GDRY	06/16/1998
Pb212		4.72e+00	6.9e-02		PCI/GDRY	06/16/1998
Pb214		5.58e+00	7.4e-02		PCI/GDRY	06/16/1998
Ra224		3.30e+00	6.0e-01		PCI/GDRY	06/16/1998
Ra226	*	4.74e+00	6.1e-01		PCI/GDRY	06/16/1998
Ra228		4.15e+00	9.8e-02		PCI/GDRY	06/16/1998
Th234	*	3.84e+00	4.1e-01		PCI/GDRY	06/16/1998
Tl208		1.48e+00	3.9e-02		PCI/GDRY	06/16/1998
U235	*	3.60e-01	3.7e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03691Z	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.850e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	71.35 %	Analyst:	N/A
Ash/dry weight:	88.67 %	QC type:	ANA

Comment: AUGER HOLE #2 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:21	1000.0	GE05	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.0e+00	PCI/GDRY	06/16/1998
Bi212		9.51e+00	5.1e-01		PCI/GDRY	06/16/1998
Bi214		1.04e+01	1.1e-01		PCI/GDRY	06/16/1998
Co60		ND		6.7e-02	PCI/GDRY	06/16/1998
Cs137		ND		7.5e-02	PCI/GDRY	06/16/1998
I131		ND		6.1e-01	PCI/GDRY	06/16/1998
K40		8.80e+00	4.3e-01		PCI/GDRY	06/16/1998
Pa234m	*	1.04e+01	3.2e+00		PCI/GDRY	06/16/1998
Pb212		1.08e+01	9.9e-02		PCI/GDRY	06/16/1998
Pb214		1.13e+01	1.0e-01		PCI/GDRY	06/16/1998
Ra223		8.12e-01	2.4e-01		PCI/GDRY	06/16/1998
Ra224		7.90e+00	8.6e-01		PCI/GDRY	06/16/1998
Ra226	*	2.15e+01	9.3e-01		PCI/GDRY	06/16/1998
Ra228		9.14e+00	1.3e-01		PCI/GDRY	06/16/1998
Rn219		4.72e-01	2.5e-01		PCI/GDRY	06/16/1998
Th228		6.11e+00	6.5e+00		PCI/GDRY	06/16/1998
Th234	*	1.01e+01	5.3e-01		PCI/GDRY	06/16/1998
Tl208		3.34e+00	5.5e-02		PCI/GDRY	06/16/1998
U235	*	1.28e+00	5.6e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03692A	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.510e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	70.28 %	Analyst:	N/A
Ash/dry weight:	88.67 %	QC type:	ANA

Comment: AUGER HOLE #2 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:21	1000.0	GE06	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		8.1e-01	PCI/GDRY	06/16/1998
Bi212		8.04e+00	4.3e-01		PCI/GDRY	06/16/1998
Bi214		8.52e+00	8.8e-02		PCI/GDRY	06/16/1998
Co60		ND		5.4e-02	PCI/GDRY	06/16/1998
Cs137		ND		6.6e-02	PCI/GDRY	06/16/1998
I131		ND		5.6e-01	PCI/GDRY	06/16/1998
K40		8.87e+00	3.4e-01		PCI/GDRY	06/16/1998
Pa234m	*	9.68e+00	2.3e+00		PCI/GDRY	06/16/1998
Pb212		8.47e+00	8.7e-02		PCI/GDRY	06/16/1998
Pb214		9.36e+00	8.4e-02		PCI/GDRY	06/16/1998
Ra223		5.89e-01	1.6e-01		PCI/GDRY	06/16/1998
Ra224		5.59e+00	7.2e-01		PCI/GDRY	06/16/1998
Ra226	*	1.76e+01	7.4e-01		PCI/GDRY	06/16/1998
Ra228		7.53e+00	1.0e-01		PCI/GDRY	06/16/1998
Th234	*	6.93e+00	4.8e-01		PCI/GDRY	06/16/1998
Tl208		2.65e+00	4.2e-02		PCI/GDRY	06/16/1998
U235	*	1.06e+00	4.5e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03693B	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.120e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	81.81 %	Analyst:	N/A
Ash/dry weight:	93.67 %	QC type:	ANA

Comment: AUGER HOLE #3 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:21	1000.0	GE07	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.1e-01	PCI/GDRY	06/16/1998
Bi212		7.09e-01	1.7e-01		PCI/GDRY	06/16/1998
Bi214		8.84e-01	3.2e-02		PCI/GDRY	06/16/1998
Co60		ND		2.5e-02	PCI/GDRY	06/16/1998
Cs137		4.29e-02	1.2e-02		PCI/GDRY	06/16/1998
I131		ND		2.1e-01	PCI/GDRY	06/16/1998
K40		1.51e+01	3.3e-01		PCI/GDRY	06/16/1998
Pb212		9.00e-01	3.2e-02		PCI/GDRY	06/16/1998
Pb214		9.57e-01	3.2e-02		PCI/GDRY	06/16/1998
Ra224		5.79e-01	3.1e-01		PCI/GDRY	06/16/1998
Ra226	*	2.22e+00	3.3e-01		PCI/GDRY	06/16/1998
Ra228		8.08e-01	3.9e-02		PCI/GDRY	06/16/1998
Tl208		2.90e-01	1.6e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03694C	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.730e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	82.60 %	Analyst:	N/A
Ash/dry weight:	96.67 %	QC type:	ANA

Comment: AUGER HOLE #3 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	*1000.0*	*GE09*	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.4e-01	PCI/GDRY	06/16/1998
Bi212		9.20e-01	1.5e-01		PCI/GDRY	06/16/1998
Bi214		8.55e-01	3.4e-02		PCI/GDRY	06/16/1998
Co60		ND		3.1e-02	PCI/GDRY	06/16/1998
Cs137		ND		2.8e-02	PCI/GDRY	06/16/1998
I131		ND		2.2e-01	PCI/GDRY	06/16/1998
K40		1.59e+01	3.6e-01		PCI/GDRY	06/16/1998
Pb212		8.98e-01	3.0e-02		PCI/GDRY	06/16/1998
Pb214		9.20e-01	3.3e-02		PCI/GDRY	06/16/1998
Ra224		5.34e-01	3.0e-01		PCI/GDRY	06/16/1998
Ra226	*	2.33e+00	2.9e-01		PCI/GDRY	06/16/1998
Ra228		8.83e-01	4.1e-02		PCI/GDRY	06/16/1998
Th234	*	7.31e-01	3.0e-01		PCI/GDRY	06/16/1998
Tl208		2.85e-01	1.7e-02		PCI/GDRY	06/16/1998
U235	*	1.40e-01	1.8e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03695D	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000051M
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	6.030e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	82.96 %	Analyst:	N/A
Ash/dry weight:	88.33 %	QC type:	ANA

Comment: AUGER HOLE #4 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/15/1998 13:41	1000.0	GE04	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		4.4e-01	PCI/GDRY	06/16/1998
Bi212		1.33e+00	1.7e-01		PCI/GDRY	06/16/1998
Bi214		1.44e+00	4.0e-02		PCI/GDRY	06/16/1998
Co60		ND		3.1e-02	PCI/GDRY	06/16/1998
Cs137		2.50e-01	1.9e-02		PCI/GDRY	06/16/1998
I131		ND		3.0e-01	PCI/GDRY	06/16/1998
K40		1.20e+01	3.4e-01		PCI/GDRY	06/16/1998
Pb212		1.27e+00	3.5e-02		PCI/GDRY	06/16/1998
Pb214		1.62e+00	3.7e-02		PCI/GDRY	06/16/1998
Ra224		1.02e+00	3.4e-01		PCI/GDRY	06/16/1998
Ra226	*	3.11e+00	3.0e-01		PCI/GDRY	06/16/1998
Ra228		1.08e+00	4.9e-02		PCI/GDRY	06/16/1998
Th234	*	1.65e+00	3.0e-01		PCI/GDRY	06/16/1998
Tl208		4.00e-01	1.9e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03696E	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000051M
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	6.920e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	87.91 %	Analyst:	N/A
Ash/dry weight:	90.00 %	QC type:	ANA

Comment: AUGER HOLE #4 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/15/1998 13:38	1000.0	GE12	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		2.6e-01	PCI/GDRY	06/16/1998
Bi212		4.67e-01	1.2e-01		PCI/GDRY	06/16/1998
Bi214		6.18e-01	2.2e-02		PCI/GDRY	06/16/1998
Co60		ND		1.7e-02	PCI/GDRY	06/16/1998
Cs137		1.12e-02	6.5e-03		PCI/GDRY	06/16/1998
I131		ND		1.7e-01	PCI/GDRY	06/16/1998
K40		1.01e+01	2.2e-01		PCI/GDRY	06/16/1998
Pa234m	*	9.30e-01	9.2e-01		PCI/GDRY	06/16/1998
Pb212		4.48e-01	2.4e-02		PCI/GDRY	06/16/1998
Pb214		6.93e-01	2.2e-02		PCI/GDRY	06/16/1998
Ra226	*	1.54e+00	2.3e-01		PCI/GDRY	06/16/1998
Ra228		4.06e-01	2.7e-02		PCI/GDRY	06/16/1998
Tl208		1.40e-01	1.1e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03697F	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000051M
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.950e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	89.12 %	Analyst:	N/A
Ash/dry weight:	91.00 %	QC type:	ANA

Comment: AUGER HOLE #5 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/15/1998 13:38	1000.0	GE09	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		2.6e-01	PCI/GDRY	06/16/1998
Bi212		5.49e-01	9.9e-02		PCI/GDRY	06/16/1998
Bi214		7.25e-01	2.5e-02		PCI/GDRY	06/16/1998
Co60		ND		2.0e-02	PCI/GDRY	06/16/1998
Cs137		6.15e-02	9.8e-03		PCI/GDRY	06/16/1998
I131		ND		1.8e-01	PCI/GDRY	06/16/1998
K40		1.23e+01	2.5e-01		PCI/GDRY	06/16/1998
Pb212		5.72e-01	2.2e-02		PCI/GDRY	06/16/1998
Pb214		7.87e-01	2.4e-02		PCI/GDRY	06/16/1998
Ra224		5.66e-01	2.4e-01		PCI/GDRY	06/16/1998
Ra226	*	1.77e+00	2.3e-01		PCI/GDRY	06/16/1998
Ra228		5.25e-01	2.8e-02		PCI/GDRY	06/16/1998
Th234	*	4.47e-01	2.0e-01		PCI/GDRY	06/16/1998
Tl208		1.71e-01	1.1e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03698G	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000051M
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.330e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	89.08 %	Analyst:	N/A
Ash/dry weight:	90.67 %	QC type:	ANA

Comment: AUGER HOLE #5 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/15/1998 13:38	1000.0	GE10	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.1e-01	PCI/GDRY	06/16/1998
Bi212		5.62e-01	1.1e-01		PCI/GDRY	06/16/1998
Bi214		7.70e-01	2.8e-02		PCI/GDRY	06/16/1998
Co60		ND		2.4e-02	PCI/GDRY	06/16/1998
Cs137		1.82e-02	8.7e-03		PCI/GDRY	06/16/1998
I131		ND		2.0e-01	PCI/GDRY	06/16/1998
K40		1.30e+01	2.7e-01		PCI/GDRY	06/16/1998
Pb212		5.78e-01	2.4e-02		PCI/GDRY	06/16/1998
Pb214		8.40e-01	2.5e-02		PCI/GDRY	06/16/1998
Ra223		8.16e-02	5.0e-02		PCI/GDRY	06/16/1998
Ra224		4.00e-01	2.3e-01		PCI/GDRY	06/16/1998
Ra226	*	2.06e+00	2.5e-01		PCI/GDRY	06/16/1998
Ra228		5.20e-01	3.2e-02		PCI/GDRY	06/16/1998
Th234	*	5.36e-01	1.8e-01		PCI/GDRY	06/16/1998
Tl208		1.78e-01	1.3e-02		PCI/GDRY	06/16/1998
U235	*	1.26e-01	1.5e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03699H	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.080e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	78.34 %	Analyst:	N/A
Ash/dry weight:	89.67 %	QC type:	ANA

Comment: AUGER HOLE #6 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:10	1000.0	GE05	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		6.6e-01	PCI/GDRY	06/16/1998
Bi212		1.50e+00	2.0e-01		PCI/GDRY	06/16/1998
Bi214		1.66e+00	4.2e-02		PCI/GDRY	06/16/1998
Co60		ND		3.2e-02	PCI/GDRY	06/16/1998
Cs137		5.78e-02	1.6e-02		PCI/GDRY	06/16/1998
I131		ND		4.9e-01	PCI/GDRY	06/16/1998
K40		1.57e+01	3.7e-01		PCI/GDRY	06/16/1998
Pa234m	*	1.34e+00	1.4e+00		PCI/GDRY	06/16/1998
Pb212		1.61e+00	3.7e-02		PCI/GDRY	06/16/1998
Pb214		1.82e+00	3.8e-02		PCI/GDRY	06/16/1998
Ra223		9.16e-02	6.5e-02		PCI/GDRY	06/16/1998
Ra224		8.13e-01	3.6e-01		PCI/GDRY	06/16/1998
Ra226	*	3.88e+00	3.8e-01		PCI/GDRY	06/16/1998
Ra228		1.47e+00	5.1e-02		PCI/GDRY	06/16/1998
Th234	*	1.62e+00	2.2e-01		PCI/GDRY	06/16/1998
Tl208		5.05e-01	2.1e-02		PCI/GDRY	06/16/1998
U235	*	2.37e-01	2.3e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03700G	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.120e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	79.41 %	Analyst:	N/A
Ash/dry weight:	92.33 %	QC type:	ANA

Comment: AUGER HOLE #6 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:10	1000.0	GE06	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		5.8e-01	PCI/GDRY	06/16/1998
Bi212		9.99e-01	1.7e-01		PCI/GDRY	06/16/1998
Bi214		1.12e+00	3.5e-02		PCI/GDRY	06/16/1998
Co60		ND		2.8e-02	PCI/GDRY	06/16/1998
Cs137		1.77e-02	9.4e-03		PCI/GDRY	06/16/1998
I131		ND		5.0e-01	PCI/GDRY	06/16/1998
K40		1.62e+01	3.3e-01		PCI/GDRY	06/16/1998
Pa234m	*	1.68e+00	1.3e+00		PCI/GDRY	06/16/1998
Pb212		1.26e+00	3.5e-02		PCI/GDRY	06/16/1998
Pb214		1.26e+00	3.3e-02		PCI/GDRY	06/16/1998
Ra224		8.47e-01	3.0e-01		PCI/GDRY	06/16/1998
Ra226	*	2.65e+00	2.9e-01		PCI/GDRY	06/16/1998
Ra228		1.16e+00	4.4e-02		PCI/GDRY	06/16/1998
Th234	*	8.61e-01	2.3e-01		PCI/GDRY	06/16/1998
Tl208		4.10e-01	1.7e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03700G	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.120e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	79.41 %	Analyst:	N/A
Ash/dry weight:	92.33 %	QC type:	DUP

Comment AUGER HOLE #6 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/23/1998 14:03	1000.0	GE11	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		4.7e-01	PCI/GDRY	06/16/1998
Bi212		1.21e+00	1.5e-01		PCI/GDRY	06/16/1998
Bi214		1.14e+00	2.9e-02		PCI/GDRY	06/16/1998
Co60		ND		2.3e-02	PCI/GDRY	06/16/1998
Cs137		2.10e-02	7.9e-03		PCI/GDRY	06/16/1998
I131		ND		3.8e-01	PCI/GDRY	06/16/1998
K40		1.71e+01	2.9e-01		PCI/GDRY	06/16/1998
Pa234m	*	1.23e+00	1.0e+00		PCI/GDRY	06/16/1998
Pb212		1.22e+00	2.8e-02		PCI/GDRY	06/16/1998
Pb214		1.27e+00	2.6e-02		PCI/GDRY	06/16/1998
Ra224		7.27e-01	2.4e-01		PCI/GDRY	06/16/1998
Ra226	*	2.81e+00	2.7e-01		PCI/GDRY	06/16/1998
Ra228		1.16e+00	3.6e-02		PCI/GDRY	06/16/1998
Th234	*	6.04e-01	1.9e-01		PCI/GDRY	06/16/1998
Tl208		3.85e-01	1.4e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03701H	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.380e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	66.43 %	Analyst:	N/A
Ash/dry weight:	83.00 %	QC type:	ANA

Comment: AUGER HOLE #7 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:10	1000.0	GE07	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		9.9e-01	PCI/GDRY	06/16/1998
Bi212		4.89e+00	3.6e-01		PCI/GDRY	06/16/1998
Bi214		5.89e+00	8.0e-02		PCI/GDRY	06/16/1998
Co60		ND		4.5e-02	PCI/GDRY	06/16/1998
Cs137		2.58e-02	1.8e-02		PCI/GDRY	06/16/1998
I131		ND		8.1e-01	PCI/GDRY	06/16/1998
K40		8.51e+00	3.7e-01		PCI/GDRY	06/16/1998
Pa234m	*	4.24e+00	2.1e+00		PCI/GDRY	06/16/1998
Pb212		4.97e+00	6.8e-02		PCI/GDRY	06/16/1998
Pb214		6.36e+00	7.2e-02		PCI/GDRY	06/16/1998
Ra224		2.55e+00	6.0e-01		PCI/GDRY	06/16/1998
Ra226	*	1.16e+01	6.8e-01		PCI/GDRY	06/16/1998
Ra228		4.43e+00	8.9e-02		PCI/GDRY	06/16/1998
Rn219		3.99e-01	1.9e-01		PCI/GDRY	06/16/1998
Th234	*	5.23e+00	4.5e-01		PCI/GDRY	06/16/1998
Tl208		1.63e+00	3.6e-02		PCI/GDRY	06/16/1998
U235	*	6.83e-01	4.0e-02		PCI/GDRY	06/16/1998

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SAMPLE ANALYSIS REPORT

Sample #:	98.03702J	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.300e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	72.77 %	Analyst:	N/A
Ash/dry weight:	83.67 %	QC type:	ANA

Comment: AUGER HOLE #7 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:27	1000.0	GE09	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		9.4e-01	PCI/GDRY	06/16/1998
Bi212		3.90e+00	3.1e-01		PCI/GDRY	06/16/1998
Bi214		5.10e+00	6.9e-02		PCI/GDRY	06/16/1998
Co60		ND		4.2e-02	PCI/GDRY	06/16/1998
Cs137		ND		5.2e-02	PCI/GDRY	06/16/1998
I131		ND		8.2e-01	PCI/GDRY	06/16/1998
K40		8.88e+00	3.2e-01		PCI/GDRY	06/16/1998
Pa234m	*	4.06e+00	2.0e+00		PCI/GDRY	06/16/1998
Pb212		4.38e+00	6.2e-02		PCI/GDRY	06/16/1998
Pb214		5.57e+00	6.7e-02		PCI/GDRY	06/16/1998
Ra224		4.23e+00	5.9e-01		PCI/GDRY	06/16/1998
Ra226	*	1.09e+01	5.4e-01		PCI/GDRY	06/16/1998
Ra228		3.93e+00	8.1e-02		PCI/GDRY	06/16/1998
Rn219		3.13e-01	1.3e-01		PCI/GDRY	06/16/1998
Th234	*	4.32e+00	4.1e-01		PCI/GDRY	06/16/1998
Tl208		1.37e+00	3.3e-02		PCI/GDRY	06/16/1998
U235	*	6.59e-01	3.3e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03703K	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.090e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	74.45 %	Analyst:	N/A
Ash/dry weight:	85.00 %	QC type:	ANA

Comment: AUGER HOLE #8 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:27	1000.0	GE10	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		8.4e-01	PCI/GDRY	06/16/1998
Bi212		2.43e+00	2.5e-01		PCI/GDRY	06/16/1998
Bi214		2.99e+00	5.9e-02		PCI/GDRY	06/16/1998
Co60		ND		4.3e-02	PCI/GDRY	06/16/1998
Cs137		1.57e-01	2.2e-02		PCI/GDRY	06/16/1998
I131		ND		6.4e-01	PCI/GDRY	06/16/1998
K40		1.59e+01	4.1e-01		PCI/GDRY	06/16/1998
Pa234m	*	4.00e+00	2.1e+00		PCI/GDRY	06/16/1998
Pb212		2.57e+00	4.9e-02		PCI/GDRY	06/16/1998
Pb214		3.22e+00	5.1e-02		PCI/GDRY	06/16/1998
Ra224		1.66e+00	4.3e-01		PCI/GDRY	06/16/1998
Ra226	*	6.10e+00	4.1e-01		PCI/GDRY	06/16/1998
Ra228		2.37e+00	6.8e-02		PCI/GDRY	06/16/1998
Th234	*	2.23e+00	2.7e-01		PCI/GDRY	06/16/1998
Tl208		8.34e-01	2.8e-02		PCI/GDRY	06/16/1998
U235	*	3.71e-01	2.5e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03704L	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.390e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	70.25 %	Analyst:	N/A
Ash/dry weight:	86.33 %	QC type:	ANA

Comment: AUGER HOLE #8 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:27	1000.0	GE11	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		6.1e-01	PCI/GDRY	06/16/1998
Bi212		2.46e+00	2.1e-01		PCI/GDRY	06/16/1998
Bi214		2.97e+00	4.5e-02		PCI/GDRY	06/16/1998
Co60		ND		2.9e-02	PCI/GDRY	06/16/1998
Cs137		3.90e-02	1.3e-02		PCI/GDRY	06/16/1998
I131		ND		4.5e-01	PCI/GDRY	06/16/1998
K40		1.43e+01	3.1e-01		PCI/GDRY	06/16/1998
Pa234m	*	2.90e+00	1.5e+00		PCI/GDRY	06/16/1998
Pb212		2.47e+00	3.9e-02		PCI/GDRY	06/16/1998
Pb214		3.15e+00	4.0e-02		PCI/GDRY	06/16/1998
Ra224		1.59e+00	3.1e-01		PCI/GDRY	06/16/1998
Ra226	*	5.77e+00	3.5e-01		PCI/GDRY	06/16/1998
Ra228		2.35e+00	5.1e-02		PCI/GDRY	06/16/1998
Th234	*	2.08e+00	2.6e-01		PCI/GDRY	06/16/1998
Tl208		8.06e-01	2.1e-02		PCI/GDRY	06/16/1998
U235	*	3.47e-01	2.1e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03705M	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.450e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	82.22 %	Analyst:	N/A
Ash/dry weight:	92.00 %	QC type:	ANA

Comment: AUGER HOLE #9 @ 0-1 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/22/1998 13:27	1000.0	GE12	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		5.4e-01	PCI/GDRY	06/16/1998
Bi212		7.22e-01	1.7e-01		PCI/GDRY	06/16/1998
Bi214		8.57e-01	3.1e-02		PCI/GDRY	06/16/1998
Co60		ND		2.7e-02	PCI/GDRY	06/16/1998
Cs137		5.58e-02	1.2e-02		PCI/GDRY	06/16/1998
I131		ND		4.2e-01	PCI/GDRY	06/16/1998
K40		1.43e+01	3.2e-01		PCI/GDRY	06/16/1998
Pb212		8.25e-01	3.3e-02		PCI/GDRY	06/16/1998
Pb214		9.34e-01	3.1e-02		PCI/GDRY	06/16/1998
Ra226	*	2.24e+00	3.0e-01		PCI/GDRY	06/16/1998
Ra228		7.23e-01	3.9e-02		PCI/GDRY	06/16/1998
Tl208		2.61e-01	1.5e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

SAMPLE ANALYSIS REPORT

Sample #:	98.03706N	QC batch #:	0000499H
Matrix:	SOIL	Prep batch #:	0000063R
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.970e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	83.69 %	Analyst:	N/A
Ash/dry weight:	92.00 %	QC type:	ANA

Comment: AUGER HOLE #9 @ 1-2 FT

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/23/1998 14:03	1000.0	GE09	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		4.9e-01	PCI/GDRY	06/16/1998
Bi212		6.68e-01	1.4e-01		PCI/GDRY	06/16/1998
Bi214		8.06e-01	3.2e-02		PCI/GDRY	06/16/1998
Co60		ND		2.6e-02	PCI/GDRY	06/16/1998
Cs137		1.24e-02	8.9e-03		PCI/GDRY	06/16/1998
I131		ND		4.4e-01	PCI/GDRY	06/16/1998
K40		1.40e+01	3.2e-01		PCI/GDRY	06/16/1998
Pb212		6.83e-01	2.7e-02		PCI/GDRY	06/16/1998
Pb214		8.73e-01	2.9e-02		PCI/GDRY	06/16/1998
Ra224		5.25e-01	2.7e-01		PCI/GDRY	06/16/1998
Ra226	*	2.33e+00	2.8e-01		PCI/GDRY	06/16/1998
Ra228		6.71e-01	3.6e-02		PCI/GDRY	06/16/1998
Tl208		2.14e-01	1.6e-02		PCI/GDRY	06/16/1998
U235	*	1.41e-01	1.7e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800054

QC BATCH SUMMARY

QC batch #: 0000499H
Preparation procedure: N/A
Analysis procedure: GAMMA

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03689F		N/A		N/A
98.03690Y		N/A		N/A
98.03691Z		N/A		N/A
98.03692A		N/A		N/A
98.03693B		N/A		N/A
98.03694C		N/A		N/A
98.03695D		N/A		N/A
98.03696E		N/A		N/A
98.03697F		N/A		N/A
98.03698G		N/A		N/A
98.03699H		N/A		N/A
98.03700G		N/A		N/A
98.03700G	DUP	N/A		N/A
98.03701H		N/A		N/A
98.03702J		N/A		N/A
98.03703K		N/A		N/A
98.03704L		N/A		N/A
98.03705M		N/A		N/A
98.03706N		N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0000499H Analytical Procedure: GAMMA

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.037C0G	BA140				
98.037C0G	BI212	9.99e-01 ± 1.7e-01	1.21e+00 ± 1.5e-01	19.10	1.53 OK
98.037C0G	BI214	1.12e+00 ± 3.5e-02	1.14e+00 ± 2.9e-02	1.77	0.24 OK
98.037C0G	CO60				
98.037C0G	CS137	1.77e-02 ± 9.4e-03	2.10e-02 ± 7.9e-03	17.05	0.52 OK
98.037C0G	I131				
98.037C0G	K40	1.62e+01 ± 3.3e-01	1.71e+01 ± 2.9e-01	5.41	0.75 OK
98.037C0G	PB212	1.26e+00 ± 3.5e-02	1.22e+00 ± 2.8e-02	3.23	-0.44 OK
98.037C0G	PB214	1.26e+00 ± 3.3e-02	1.27e+00 ± 2.6e-02	0.79	0.11 OK
98.037C0G	RA224	8.47e-01 ± 3.0e-01	7.27e-01 ± 2.4e-01	15.25	-0.60 OK
98.037C0G	RA228	1.16e+00 ± 4.4e-02	1.16e+00 ± 3.6e-02	0.00	0.00 OK
98.037C0G	TL208	4.10e-01 ± 1.7e-02	3.85e-01 ± 1.4e-02	6.29	-0.83 OK

Analyst: _____ _____

QA Officer: Kirk McCrea 9/4/98

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800055

Project: SANYO
Procedure: Gamma spectroscopy
Date Reported: 08/24/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03707F	SED-1	SAM	SEDIMENT	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 9/9/98
for James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, and U-235 are subject to greater possible error than other commonly reported radionuclides. It should be noted that this potential error is not included in the two-sigma counting error which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800055

ANALYSIS SUMMARY

Analysis Procedure: GAMMA
Title: Gamma spectroscopy

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03707P		N/A	07/24/1998	0000064T	0000500G
98.03707P	DUP	N/A	07/25/1998	0000064T	0000500G

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800055

SAMPLE ANALYSIS REPORT

Sample #:	98.03707P	QC batch #:	0000500G
Matrix:	SEDIMENT	Prep batch #:	0000064T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	7.170e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	85.03 %	Analyst:	N/A
Ash/dry weight:	92.67 %	QC type:	ANA

Comment: SEDIMENT SAMPLE FROM PARK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/23/1998 14:03	1000.0	GE10	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.1e-01	PCI/GDRY	06/16/1998
Be7		9.07e-02	7.2e-02		PCI/GDRY	06/16/1998
Bi212		1.94e-01	7.2e-02		PCI/GDRY	06/16/1998
Bi214		3.53e-01	1.8e-02		PCI/GDRY	06/16/1998
Co60		ND		1.5e-02	PCI/GDRY	06/16/1998
Cs137		1.60e-02	6.9e-03		PCI/GDRY	06/16/1998
I131		ND		2.5e-01	PCI/GDRY	06/16/1998
K40		7.09e+00	1.8e-01		PCI/GDRY	06/16/1998
Pb212		2.09e-01	1.5e-02		PCI/GDRY	06/16/1998
Pb214		3.74e-01	1.6e-02		PCI/GDRY	06/16/1998
Ra224		1.51e-01	1.6e-01		PCI/GDRY	06/16/1998
Ra226	*	9.02e-01	1.6e-01		PCI/GDRY	06/16/1998
Ra228		1.88e-01	2.2e-02		PCI/GDRY	06/16/1998
Tl208		6.98e-02	8.2e-03		PCI/GDRY	06/16/1998
U235	*	5.51e-02	9.8e-03		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800055

SAMPLE ANALYSIS REPORT

Sample #:	98.03707P	QC batch #:	0000500G
Matrix:	SEDIMENT	Prep batch #:	0000064T
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	7.170e+02 GDRY	Analysis procedure:	GAMMA
Dry/wet weight:	85.03 %	Analyst:	N/A
Ash/dry weight:	92.67 %	QC type:	DUP

Comment: SEDIMENT SAMPLE FROM PARK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/24/1998 11:45	1000.0	GE12	DJK

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		3.5e-01	PCI/GDRY	06/16/1998
Be7		6.54e-02	6.8e-02		PCI/GDRY	06/16/1998
Bi212		1.59e-01	1.0e-01		PCI/GDRY	06/16/1998
Bi214		3.74e-01	1.8e-02		PCI/GDRY	06/16/1998
Co60		ND		1.6e-02	PCI/GDRY	06/16/1998
Cs137		1.06e-02	5.5e-03		PCI/GDRY	06/16/1998
I131		ND		3.2e-01	PCI/GDRY	06/16/1998
K40		7.13e+00	1.9e-01		PCI/GDRY	06/16/1998
Pb212		2.07e-01	1.9e-02		PCI/GDRY	06/16/1998
Pb214		4.00e-01	1.8e-02		PCI/GDRY	06/16/1998
Ra226	*	6.91e-01	1.7e-01		PCI/GDRY	06/16/1998
Ra228		1.84e-01	2.2e-02		PCI/GDRY	06/16/1998
Tl208		5.99e-02	8.6e-03		PCI/GDRY	06/16/1998
U235	*	4.29e-02	1.0e-02		PCI/GDRY	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800055

QC BATCH SUMMARY

QC batch #: 0000500G
Preparation procedure: N/A
Analysis procedure: GAMMA

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03707P		N/A		N/A
98.03707P	DUP	N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0000500G Analytical Procedure: GAMMA

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.03707P	BA140				
98.03707P	BE7	9.07e-02 ± 7.2e-02	6.54e-02 ± 6.8e-02	32.42	-0.51 OK
98.03707P	BI212	1.94e-01 ± 7.2e-02	1.59e-01 ± 1.0e-01	19.83	-0.54 OK
98.03707P	BI214	3.53e-01 ± 1.8e-02	3.74e-01 ± 1.8e-02	5.78	0.73 OK
98.03707P	CO60				
98.03707P	CS137	1.60e-02 ± 6.9e-03	1.06e-02 ± 5.5e-03	40.60	-1.20 OK
98.03707P	I131				
98.03707P	K40	7.09e+00 ± 1.8e-01	7.13e+00 ± 1.9e-01	0.56	0.08 OK
98.03707P	PB212	2.09e-01 ± 1.5e-02	2.07e-01 ± 1.9e-02	0.96	-0.10 OK
98.03707P	PB214	3.74e-01 ± 1.6e-02	4.00e-01 ± 1.8e-02	6.72	0.87 OK
98.03707P	RA228	1.88e-01 ± 2.2e-02	1.84e-01 ± 2.2e-02	2.15	-0.20 OK
98.03707P	TL208	6.98e-02 ± 8.2e-03	5.99e-02 ± 8.6e-03	15.27	-1.32 OK

Analyst: _____

QA Officer: Kirk McClure 9/4/98

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #9800056

Project: SANYO
Procedure: Gamma spectroscopy
Date Reported: 08/24/1998

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
98.03708Q	SW-1A	SAM	WATER-SURFACE	06/16/1998	06/18/1998
98.03709R	SW-1B	SAM	WATER-SURFACE	06/16/1998	06/18/1998
98.03710J	SW-2	SAM	WATER-SURFACE	06/16/1998	06/18/1998

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

Mary Wisdom 9/9/98
for James B. Moore Date
Quality Assurance Coordinator

John Griggs 9/8/98
John Griggs, Ph.D. Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations (counting uncertainty) below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores". A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the estimated total uncertainty in the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the estimated total uncertainty in the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measurement and the net concentrations are then converted to total activities before the Z score is computed.

Each measurement uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Th-234, Pa-234m, Ra-226, and U-235 are subject to greater possible error than other commonly reported radionuclides. It should be noted that this potential error is not included in the two-sigma counting error which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

ANALYSIS SUMMARY

Analysis Procedure: GAMMA
Title: Gamma spectroscopy

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
98.03708Q		N/A	07/15/1998	0001446H	0000501H
98.03709R		N/A	07/15/1998	0001446H	0000501H
98.03710J		N/A	07/15/1998	0001446H	0000501H
98.03710J	DUP	N/A	07/15/1998	0001446H	0000501H

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03708Q	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SURFACE WATER SAMPLE FROM POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE10	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		7.4e+01	PCI/L	06/16/1998
Co60	ND		5.6e+00	PCI/L	06/16/1998
Cs137	ND		4.7e+00	PCI/L	06/16/1998
I131	ND		4.6e+01	PCI/L	06/16/1998
K40	ND		5.6e+01	PCI/L	06/16/1998
Ra226	ND		8.1e+01	PCI/L	06/16/1998
Ra228	ND		1.7e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03709R	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SURFACE WATER SAMPLE FROM POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE12	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		8.4e+01	PCI/L	06/16/1998
Co60	ND		6.1e+00	PCI/L	06/16/1998
Cs137	ND		6.0e+00	PCI/L	06/16/1998
I131	ND		5.6e+01	PCI/L	06/16/1998
K40	ND		6.3e+01	PCI/L	06/16/1998
Ra226	ND		9.9e+01	PCI/L	06/16/1998
Ra228	ND		1.9e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03710J	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	ANA

Comment: SURFACE WATER SAMPLE FROM CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:21	1000.0	GE08	KNG

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140	ND		8.9e+01	PCI/L	06/16/1998
Co60	ND		9.0e+00	PCI/L	06/16/1998
Cs137	ND		6.4e+00	PCI/L	06/16/1998
I131	ND		6.3e+01	PCI/L	06/16/1998
K40	ND		8.3e+01	PCI/L	06/16/1998
Pb212	6.40e+00	7.8e+00		PCI/L	06/16/1998
Ra226	ND		1.1e+02	PCI/L	06/16/1998
Ra228	ND		2.3e+01	PCI/L	06/16/1998

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

SAMPLE ANALYSIS REPORT

Sample #:	98.03710J	QC batch #:	0000501H
Matrix:	WATER-SURFACE	Prep batch #:	0001446H
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e+00 L	Analysis procedure:	GAMMA
Dry/wet weight:	N/A	Analyst:	N/A
Ash/dry weight:	N/A	QC type:	DUP

Comment: SURFACE WATER SAMPLE FROM CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/14/1998 13:37	1000.0	GE01	KNG

ANALYTICAL RESULTS

Analyte		Activity	± 2σ Uncertainty	MDC	Unit	Date
Ba140		ND		1.4e+02	PCI/L	06/16/1998
Co60		ND		1.9e+01	PCI/L	06/16/1998
Cs137		ND		1.2e+01	PCI/L	06/16/1998
I131		ND		6.5e+01	PCI/L	06/16/1998
K40		ND		1.9e+02	PCI/L	06/16/1998
Ra226	*	6.80e+01	8.1e+01		PCI/L	06/16/1998
Ra228		ND		4.9e+01	PCI/L	06/16/1998

* An asterisk indicates a result whose value may be significantly over or underestimated.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
GAMMA ANALYSES
SDG #9800056

QC BATCH SUMMARY

QC batch #: 0000501H
Preparation procedure: N/A
Analysis procedure: GAMMA

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
98.03708Q		N/A		N/A
98.03709R		N/A		N/A
98.03710J		N/A		N/A
98.03710J	DUP	N/A		N/A

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

C Batch #: 0000501H Analytical Procedure: GAMMA

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
98.03710J	BA140				
98.03710J	CO60				
98.03710J	CS137				
98.03710J	I131				
98.03710J	K40				
98.03710J	RA228				

Analyst: _____ _____

QA Officer: Kenneth McEwen 9/4/98

SANYO SOIL SAMPLES---SUMMARY						
		SEDIMENT			WATER	WATER
		TOTAL RADIUM (pCi/g)	MEAN URANIUM (pCi/g)	THORIUM (pCi/g)	GROSS ALPHA (pCi/L)	GROSS BETA (pCi/L)
Auger Hole #1	0-1 ft	16.0				
Auger Hole #1	1-2 ft	8.9				
Auger Hole #2	0-1 ft	31.5				
Auger Hole #2	1-2 ft	25.7				
Auger Hole #3	0-1 ft	3				
Auger Hole #3	1-2 ft	3.4				
Auger Hole #4	0-1 ft	4.2				
Auger Hole #4	1-2 ft	1.9				
Auger Hole #5	0-1 ft	2.3				
Auger Hole #5	1-2 ft	2.7				
Auger Hole #6	0-1 ft	5.4				
Auger Hole #6	1-2 ft	3.8				
Auger Hole #6--DUP	1-2 ft	4				
Auger Hole #7	0-1 ft	16.7				
Auger Hole #7	1-2 ft	15.5				
Auger Hole #8	0-1 ft	8.8				
Auger Hole #8	1-2 ft	8.5				
Auger Hole #9	0-1 ft	3				
Auger Hole #9	1-2 ft	3.1				
Sediment-Park		1.1				
Sediment-Park	DUP	0.9				
Surface Water #1--Pond					-0.0261	2.21
Surface Water #2--Pond					1.01	2.26
Surface Water--Creek					-0.423	2.15
Surface Water--Creek	DUP				0.275	2.94

Auger Hole #1	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	3.84		
98.03690Y		Pa-234m	5.37		
		U-234			
		Th-230			
		Ra-226	4.74		
		Pb-214	5.58		
		Bi-214	5.19		
	THORIUM	Th-232			
		Ra-228	4.15		
		Th-228			
		Ra-224	3.3		
		Pb-212	4.72		
		Bi-212	4.7		
		TL-208	1.48		
	ACTINIUM	U-235	0.36		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	10.8		
		Cs-137	ND		
		Ra-226 + Ra-228	8.9		
		Ra-226 + Ra-228 + Ra-223	8.9		

Auger Hole #2	**URANIUM**	U-238		pCi/g	pCi/g
0-1 ft		Th-234	10.1		
98.03691Z		Pa-234m	10.4		
		U-234			
		Th-230			
		Ra-226	21.5		
		Pb-214	11.3		
		Bi-214	10.4		
	THORIUM	Th-232			
		Ra-228	9.14		
		Th-228	6.11		
		Ra-224	7.9		
		Pb-212	10.8		
		Bi-212	9.51		
		TL-208	3.34		
	ACTINIUM	U-235	1.28		
		Th-227			
		Ra-223	0.812		
		Rn-219	0.472		
	OTHERS	K-40	8.8		
		Cs-137	ND		
		Ra-226 +Ra-228	30.6		
		Ra-226 + Ra-228 + Ra-223	31.5		

Auger Hole #2	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	6.93		
98.03692A		Pa-234m	9.68		
		U-234			
		Th-230			
		Ra-226	17.6		
		Pb-214	9.36		
		Bi-214	8.52		
	THORIUM	Th-232			
		Ra-228	7.53		
		Th-228			
		Ra-224	5.59		
		Pb-212	8.47		
		Bi-212	8.04		
		TL-208	2.65		
	ACTINIUM	U-235	1.06		
		Th-227			
		Ra-223	0.589		
		Rn-219			
	OTHERS	K-40	8.87		
		Cs-137	ND		
		Ra-226 + Ra-228	25.1		
		Ra-226 + Ra-228 + Ra-223	25.7		

Auger Hole #3	**URANIUM**	U-238		pCi/g	pCi/g
0-1 ft		Th-234			
98.03693B		Pa-234m			
		U-234			
		Th-230			
		Ra-226	2.22		
		Pb-214	0.957		
		Bi-214	0.884		
	THORIUM	Th-232			
		Ra-228	0.808		
		Th-228			
		Ra-224	0.579		
		Pb-212	0.9		
		Bi-212	0.709		
		TL-208	0.29		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	15.1		
		Cs-137	0.0429		
		Ra-226 + Ra-228	3.0		
		Ra-226 + Ra-228 + Ra-223	3.0		

Auger Hole #3	**URANIUM**	U-238		
1-2 ft		Th-234	0.731	pCi/g
98.03694C		Pa-234m		
		U-234		
		Th-230		
		Ra-226	2.33	
		Pb-214	0.92	
		Bi-214	0.855	
	THORIUM	Th-232		
		Ra-228	0.883	
		Th-228		
		Ra-224	0.534	
		Pb-212	0.898	
		Bi-212	0.92	
		TL-208	0.285	
	ACTINIUM	U-235	0.14	
		Th-227		
		Ra-223		
		Rn-219		
	OTHERS	K-40	15.9	
		Cs-137	ND	
		Ra-226 + Ra-228	3.2	
		Ra-226 + Ra-228 + Ra-223	3.4	

Auger Hole #4 0-1 ft 98.03695D	**URANIUM**	U-238 Th-234 Pa-234m U-234 Th-230 Ra-226 Pb-214 Bi-214	1.65 3.11 1.62 1.44	pCi/g
	THORIUM	Th-232 Ra-228 Th-228 Ra-224 Pb-212 Bi-212 TL-208	 1.08 1.02 1.27 1.33 0.4	
	ACTINIUM	U-235 Th-227 Ra-223 Rn-219		
	OTHERS	K-40 Cs-137	12.0 0.25	
		Ra-226 + Ra-228	4.2	
		Ra-226 + Ra-228 + Ra-223	4.2	

Auger Hole #4	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234			
98.03696E		Pa-234m	0.93		
		U-234			
		Th-230			
		Ra-226	1.54		
		Pb-214	0.693		
		Bi-214	0.618		
	THORIUM	Th-232			
		Ra-228	0.406		
		Th-228			
		Ra-224			
		Pb-212	0.448		
		Bi-212	0.467		
		TL-208	0.14		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	10.1		
		Cs-137	0.0112		
		Ra-226 + Ra-228	1.9		
		Ra-226 + Ra-228 + Ra-223	1.9		

Auger Hole #5	**URANIUM**	U-238		pCi/g	pCi/g
0-1 ft		Th-234	0.447		
98.03697F		Pa-234m			
		U-234			
		Th-230			
		Ra-226	1.77		
		Pb-214	0.787		
		Bi-214	0.725		
	THORIUM	Th-232			
		Ra-228	0.525		
		Th-228			
		Ra-224	0.566		
		Pb-212	0.572		
		Bi-212	0.549		
		TL-208	0.171		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	12.3		
		Cs-137	0.0615		
		Ra-226 + Ra-228	2.3		
		Ra-226 + Ra-228 + Ra-223	2.3		

Auger Hole #5	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	0.536		
98 03698G		Pa-234m			
		U-234			
		Th-230			
		Ra-226	2.06		
		Pb-214	0.84		
		Bi-214	0.77		
	THORIUM	Th-232			
		Ra-228	0.52		
		Th-228			
		Ra-224	0.4		
		Pb-212	0.578		
		Bi-212	0.562		
		TL-208	0.178		
	ACTINIUM	U-235	0.126		
		Th-227			
		Ra-223	0.0816		
		Rn-219			
	OTHERS	K-40	13.0		
		Cs-137	0.0182		
		Ra-226 + Ra-228	2.6		
		Ra-226 + Ra-228 + Ra-223	2.7		

Auger Hole #6	**URANIUM**	U-238		pCi/g	pCi/g
0-1 ft		Th-234	1.62		
98.03699H		Pa-234m	1.34		
		U-234			
		Th-230			
		Ra-226	3.88		
		Pb-214	1.82		
		Bi-214	1.66		
	THORIUM	Th-232			
		Ra-228	1.47		
		Th-228			
		Ra-224	0.813		
		Pb-212	1.61		
		Bi-212	1.5		
		TL-208	0.505		
	ACTINIUM	U-235	0.237		
		Th-227			
		Ra-223	0.0916		
		Rn-219			
	OTHERS	K-40	15.7		
		Cs-137	0.0578		
		Ra-226 + Ra-228	5.4		
		Ra-226 + Ra-228 + Ra-223	5.4		

Auger Hole #6	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	0.861		
98.03700G		Pa-234m	1.68		
		U-234			
		Th-230			
		Ra-226	2.65		
		Pb-214	1.26		
		Bi-214	1.12		
	THORIUM	Th-232			
		Ra-228	1.16		
		Th-228			
		Ra-224	0.847		
		Pb-212	1.26		
		Bi-212	0.999		
		TL-208	0.41		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	16.1		
		Cs-137	0.0177		
		Ra-226 +Ra-228	3.8		
		Ra-226 + Ra-228 + Ra-223	3.8		

Auger Hole #6	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	0.604		
98.03700G		Pa-234m	1.23		
DUP		U-234			
		Th-230			
		Ra-226	2.81		
		Pb-214	1.27		
		Bi-214	1.14		
	THORIUM	Th-232			
		Ra-228	1.16		
		Th-228			
		Ra-224	0.727		
		Pb-212	1.22		
		Bi-212	1.21		
		TL-208	0.385		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	17.1		
		Cs-137	0.021		
		Ra-226 + Ra-228	4.0		
		Ra-226 + Ra-228 + Ra-223	4.0		

Auger Hole #7	**URANIUM**	U-238		pCi/g
0-1 ft		Th-234	5.23	
98.03701H		Pa-234m	4.24	
		U-234		
		Th-230		
		Ra-226	11.6	
		Pb-214	6.36	
		Bi-214	5.89	
	THORIUM	Th-232		
		Ra-228	4.43	
		Th-228		
		Ra-224	2.55	
		Pb-212	4.97	
		Bi-212	4.89	
		TL-208	1.63	
	ACTINIUM	*U-235*	0.683	
		Th-227		
		Ra-223		
		Rn-219	0.399	
	OTHERS	K-40	8.51	
		Cs-137	0.0258	
		Ra-226 + Ra-228	16.0	
		Ra-226 + Ra-228 + Ra-223	16.7	

Auger Hole #7
1-2 ft
98 03702J

URANIUM	U-238		
	Th-234	4.32	pCi/g
	Pa-234m	4.06	
	U-234		
	Th-230		
	Ra-226	10.9	
	Pb-214	5.57	
	Bi-214	5.1	
THORIUM	Th-232		
	Ra-228	3.93	
	Th-228		
	Ra-224	4.23	
	Pb-212	4.38	
	Bi-212	3.9	
	TL-208	1.37	
ACTINIUM	U-235	0.659	
	Th-227		
	Ra-223		
	Rn-219	0.313	
OTHERS	K-40	8.88	
	Cs-137	ND	
	Ra-226 + Ra-228	14.8	
	Ra-226 + Ra-228 + Ra-223	15.5	

Auger Hole #8	**URANIUM**	U-238			
0-1 ft		Th-234	2.23	pCi/g	pCi/g
98.03703K		Pa-234m	4.00		
		U-234			
		Th-230			
		Ra-226	6.1		
		Pb-214	3.22		
		Bi-214	2.99		
	THORIUM	Th-232			
		Ra-228	2.37		
		Th-228			
		Ra-224	1.66		
		Pb-212	2.57		
		Bi-212	2.43		
		TL-208	0.834		
	ACTINIUM	U-235	0.371		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	15.9		
		Cs-137	0.157		
		Ra-226 + Ra-228	8.5		
		Ra-226 + Ra-228 + Ra-223	8.8		

Auger Hole #8	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234	2.08		
98.03704L		Pa-234m	2.9		
		U-234			
		Th-230			
		Ra-226	5.77		
		Pb-214	3.15		
		Bi-214	2.97		
	THORIUM	Th-232			
		Ra-228	2.35		
		Th-228			
		Ra-224	1.59		
		Pb-212	2.47		
		Bi-212	2.46		
		TL-208	0.806		
	ACTINIUM	U-235	0.347		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	14.3		
		Cs-137	0.039		
		Ra-226 + Ra-228	8.1		
		Ra-226 + Ra-228 + Ra-223	8.5		

Auger Hole #9	**URANIUM**	U-238		pCi/g	pCi/g
0-1 ft		Th-234			
98.03705M		Pa-234m			
		U-234			
		Th-230			
		Ra-226	2.24		
		Pb-214	0.934		
		Bi-214	0.857		
	THORIUM	Th-232			
		Ra-228	0.723		
		Th-228			
		Ra-224			
		Pb-212	0.825		
		Bi-212	0.722		
		TL-208	0.261		
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	14.3		
		Cs-137	0.0558		
		Ra-226 + Ra-228	3.0		
		Ra-226 + Ra-228 + Ra-223	3.0		

Auger Hole #9	**URANIUM**	U-238		pCi/g	pCi/g
1-2 ft		Th-234			
98.03706N		Pa-234m			
		U-234			
		Th-230			
		Ra-226	2.33		
		Pb-214	0.873		
		Bi-214	0.806		
	THORIUM	Th-232			
		Ra-228	0.671		
		Th-228			
		Ra-224	0.525		
		Pb-212	0.683		
		Bi-212	0.668		
		TL-208	0.214		
	ACTINIUM	U-235	0.141		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	14.0		
		Cs-137	0.0124		
		Ra-226 + Ra-228	3.0		
		Ra-226 + Ra-228 + Ra-223	3.1		

Sediment	**URANIUM**	U-238		pCi/g	pCi/g
Park		Th-234			
98.03707P		Pa-234m			
		U-234			
		Th-230			
		Ra-226	0.902		
		Pb-214	0.374		
		Bi-214	0.353		
	THORIUM	Th-232			
		Ra-228	0.188		
		Th-228			
		Ra-224	0.151		
		Pb-212	0.209		
		Bi-212	0.194		
		TL-208	0.0698		
	ACTINIUM	U-235	0.0551		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	7.09		
		Cs-137	0.016		
		Be-7	0.0907		
		Ra-226 + Ra-228	1.1		
		Ra-226 + Ra-228 + Ra-223	1.1		

Sediment	**URANIUM**	U-238		pCi/g	pCi/g
Park		Th-234			
98.03707P		Pa-234m			
DUP		U-234			
		Th-230			
		Ra-226	0.691		
		Pb-214	0.400		
		Bi-214	0.374		
	THORIUM	Th-232			
		Ra-228	0.184		
		Th-228			
		Ra-224			
		Pb-212	0.207		
		Bi-212	0.159		
		TL-208	0.0599		
	ACTINIUM	U-235	0.0429		
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	7.13		
		Cs-137	0.0106		
		Be-7	0.0654		
		Ra-226 + Ra-228	0.9		
		Ra-226 + Ra-228 + Ra-223	0.9		

Surface water Pond 98.03708Q	**URANIUM**	U-238		pCi/g	pCi/g
		Th-234			
		Pa-234m			
		U-234			
		Th-230			
		Ra-226	ND		
		Pb-214			
		Bi-214			
	THORIUM	Th-232			
		Ra-228	ND		
		Th-228			
		Ra-224			
		Pb-212			
		Bi-212			
		TL-208			
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	ND		
		Cs-137	ND		
		Gross alpha	-0.0261		
		Gross beta	2.21		
		Ra-226 + Ra-228			

Surface water	**URANIUM**	U-238		pCi/g	pCi/g
Pond		Th-234			
98.03709R		Pa-234m			
		U-234			
		Th-230			
		Ra-226	ND		
		Pb-214			
		Bi-214			
	THORIUM	Th-232			
		Ra-228	ND		
		Th-228			
		Ra-224			
		Pb-212			
		Bi-212			
		TL-208			
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	ND		
		Cs-137	ND		
		Gross alpha	1.01		
		Gross beta	2.26		
		Ra-226 + Ra-228			

Surface water Creek 98.03710J	**URANIUM**	U-238		pCi/g	pCi/g
		Th-234			
		Pa-234m			
		U-234			
		Th-230			
		Ra-226	ND		
		Pb-214			
		Bi-214			
	THORIUM	Th-232			
		Ra-228	ND		
		Th-228			
		Ra-224			
		Pb-212	6.40	+/- 7.8	
		Bi-212			
		TL-208			
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	ND		
		Cs-137	ND		
		Gross alpha	-0.423		
		Gross beta	2.15		
		Ra-226 + Ra-228			

Surface water	**URANIUM**	U-238		pCi/g	pCi/g
Creek		Th-234			
98.03710J		Pa-234m			
DUP		U-234			
		Th-230			
		Ra-226	68.0	+/- 81	
		Pb-214			
		Bi-214			
	THORIUM	Th-232			
		Ra-228	ND		
		Th-228			
		Ra-224			
		Pb-212			
		Bi-212			
		TL-208			
	ACTINIUM	U-235			
		Th-227			
		Ra-223			
		Rn-219			
	OTHERS	K-40	ND		
		Cs-137	ND		
		Gross alpha	0.275		
		Gross beta	2.94		
		Ra-226 + Ra-228			

SANYO SOIL SAMPLES--GAMMA SPECTROMETRY RESULTS

SAMPLE I.D.	CHAIN	NUCLIDE	GAMMA SPEC ACTIVITY		RADIO CHEM ACTIVITY	
				pCi/g		pCi/g
Auger Hole #1	**URANIUM**	U-238				
0-1 ft		Th-234	6.97			
98.03689F		Pa-234m	8.04			
		U-234				
		Th-230				
		Ra-226	9.18			
		Pb-214	8.38			
		Bi-214	7.96			
	THORIUM	Th-232				
		Ra-228	6.29			
		Th-228				
		Ra-224	4.40			
		Pb-212	6.56			
		Bi-212	6.56			
		TL-208	2.27			
	ACTINIUM	U-235	0.42			
		Th-227				
		Ra-223	0.565			
		Rn-219				
	OTHERS	K-40	9.01			
		Cs-137	ND			
		Ra-226 + Ra-228	15.5			
		Ra-226 + Ra-228 + Ra-223	16.0			

Attachment C

Tables

Table 1

SOIL AND SEDIMENT SAMPLE RADIOLOGICAL ANALYSIS
SANYO SITE
RICHMOND, WAYNE COUNTY, INDIANA
JUNE 16, 1998

units = pCi/g (dry)

Sample Designation	Gross Alpha[1]	Gross Beta[1]	Total Radium[b]	Bi-212	Cs-137	Pb-214	Ra-226	Th-234	U-235
SS1-1A	122±18	53.2±5.8	16.0	6.56±0.52	ND	8.38±0.01	9.18±0.73	6.97±0.49	0.42±0.04
SS1-2A	74.9±15	42.5±5.2	8.9	4.79±0.40	ND	5.58±0.07	4.74±0.61	3.84±0.41	0.36±0.04
SS2-1A	130±20	70.3±6.9	31.5	9.51±0.51	ND	11.3±0.10	21.5±0.93	10.1±0.53	1.28±0.06
SS2-2A	108±17	63.7±6.0	25.2	8.04±0.43	ND	9.36±0.08	17.6±0.74	6.93±0.48	1.06±0.05
SS3-1A	24.9±8.7	20.4±3.7	3	0.88±0.03	0.04±0.01	0.96±0.03	2.22±0.33	ND	ND
SS3-2A	15.9±7.4	24.5±4.0	3.4	0.92±0.15	ND	0.92±0.33	2.33±0.29	0.73±0.30	0.14±0.02
SS4-1A	19.8±7.9	23.5±3.9	4.2	1.33±0.17	0.25±0.02	1.62±0.04	3.11±0.30	1.65±0.30	0.40±0.02
SS4-2A	12.2±6.3	14.3±3.8	1.9	0.47±0.12	ND	0.69±0.02	1.54±0.02	ND	ND
SS5-1A	26.1±9.5	20.8±3.8	2.3	0.55±0.10	0.06±0.01	0.79±0.02	1.77±0.02	0.45±0.20	ND
SS5-2A	17.1±7.7	16.8±3.5	2.7	0.56±0.11	0.02±0.01	0.84±0.03	2.06±0.25	0.54±0.18	0.13±0.02
SS6-1A	23.6±10.0	27.5±4.3	5.4	1.50±0.20	0.06±0.02	1.82±0.04	3.88±0.38	1.62±0.22	0.24±0.02
SS6-2A	24.8±8.6	20.6± 3.7	3.8	1.04±0.17	0.02±0.01	1.26±0.03	2.65±0.29	0.86±0.02	ND
SS6-2ADup	25.2±8.8	24.8±3.9	4.0	1.21±0.15	0.02±0.01	1.27±0.03	2.81±0.27	0.60±0.19	ND
SS7-1A	97.7±17.0	48.3± 5.4	16.7	4.89±0.36	0.03±0.02	6.36±0.72	11.6±0.68	5.23±0.45	0.68±0.04
SS7-2A	90.7±17.0	39.2± 5.1	15.5	3.9±0.31	ND	5.57±0.07	10.9±0.54	4.32±0.41	0.66±0.03
SS8-1A	59.6±13.0	37.1±4.8	8.8	2.43±0.25	0.16±0.02	3.22±0.05	6.10±0.41	2.73±0.27	0.37±0.03
SS8-2A	54.5±13.0	34.8±4.9	8.5	2.46±0.21	0.04±0.01	3.15±0.04	5.77±0.35	2.08±0.26	0.35±0.02
SS9-1A	17.1±8.2	23.3±4.0	3.0	0.72±0.17	0.06±0.01	0.85±0.03	2.24±0.03	ND	ND
SS9-2A	14.8±7.0	23.4±3.9	3.1	0.67±0.14	ND	0.87±0.03	2.33±0.28	ND	0.14±0.02
SED-1	14.8±7.0	10.7±3.1	1.1	0.19±0.07	0.02±0.01	0.37±0.02	0.90±0.16	ND	0.06±0.01
SED-1Dup	12.4±6.8	12.5±3.2	0.9	0.16±0.10	ND	0.40±0.02	0.69±0.17	ND	0.04±0.01

Key:

pCi/g (dry) == Picocuries per gram of dry weight.
[1] pCi/g (ash) == Picocuries per gram from ash.
[b] Total Radium == Ra-223 (pCi/g)+Ra-226(pCi/g)+Ra-228(pCi/g)+2 standard deviations for each radionuclide.
ND == Non detect.

Note: Each result has an error of 2 standard deviations.

Source: United States Environmental Protection Agency, National Air and Radiation Environmental Laboratory, Montgomery, Alabama.

Table 2

SURFACE WATER SAMPLE RESULTS
SANYO SITE
RICHMOND, WAYNE, INDIANA
JUNE 16, 1998

units = pCi/L

Sample Designation	Gross Alpha	Gross Beta	Cs-137	Pb-212	Ra-226
SW-1A	ND	2.21±2.2	ND	ND	ND
SW-1B	ND	2.26±2.2	ND	ND	ND
SW-2	ND	ND	ND	ND	ND

Key:

pCi/L = picoCuries per liter.
ND = Non detect.

Source: United States Environmental Protection Agency, National Air and Radiation Environmental Laboratory, Montgomery, Alabama.

Attachment D

Cost Projections

Cost Summary

Projection Name: Sanyo Site
Projection Type: Initial

Date: 11/12/98
Prime Contractor: ETI5

		Projection	Archive	Total
CONTRACTOR				
	Personnel Cost	76160	0	76160
	Equipment Cost	49320	0	49320
	Other Direct Cost	7943940	0	7943940
	Total for Contractor	8069420	0	8069420
	Contractor Contingency:15.00%			1210413
	Including Contractor Contingency			9279833
	Site Contingency:15.00%			1210413
	Including Site Contingency			10490246
GOVERNMENT				
	Personnel Cost	0	0	0
	Equipment Cost	0	0	0
	Other Direct Cost	0	0	0
	Total for Goverment	0	0	0
	Site Contingency: 15.00%			0
	Including Site Contingency			0
PROJECT TOTAL				10490246

Contractor

Equipment by CLIN

Projection Name: Sanyo Site

Projection Type: Initial

Date: 11/12/98

CLIN	Equipment Description	Ctr. Code	Hrs/ Days	Qty	Reg Days	Mob Days	Stby Days	Decon Days	Task Code	Task Description	Projected Cost	Total Cost
10910	Car-Passenger	ETI5	0.0	1	28	0	0	0	06	Administrative	1260	1260
13610	Pickup-2 wheel drive	ETI5	0.0	1	28	0	0	0	06	Administrative	1680	1680
15430	Van-Passenger	ETI5	0.0	1	28	0	0	0	06	Administrative	2100	2100
24550	Lowboy-50 ton	ETI5	0.0	3	4	0	0	0	06	Administrative	1440	1440
30120	Backhoe-CAT 436/438	ETI5	0.0	1	28	0	0	0	06	Administrative	5600	5600
33065	Excavator-CAT 225B LC	ETI5	0.0	1	28	0	0	0	06	Administrative	14000	14000
35540	Loader/Track-CAT 951/953/955 2cy	ETI5	0.0	1	28	0	0	0	06	Administrative	12600	12600
50132	Meter/Monitor-Alpha Meter	ETI5	0.0	1	28	0	0	0	06	Administrative	1120	1120
50133	Meter/Monitor-BETA GAMMA METER L	ETI5	0.0	1	28	0	0	0	06	Administrative	1120	1120
50140	Meter/Monitor-Aerosol/Miniram	ETI5	0.0	1	28	0	0	0	06	Administrative	1400	1400
72320	Computer-Portable PC	ETI5	0.0	1	28	0	0	0	06	Administrative	420	420
75140	Generator-50 KW	ETI5	0.0	1	28	0	0	0	06	Administrative	4200	4200
75513	Hose-Discharge / 4"	ETI5	0.0	1	28	0	0	0	06	Administrative	140	140
81846	Double Diaphram-Teflon 4 inch	ETI5	0.0	1	28	0	0	0	06	Administrative	2240	2240
										(Equipmert Totals:)	49,320	49,320
										(Including Contractor Contingency:15.00%)		56,718
										(Including Site Contingency:15.00%)		64,116

Contractor

Other Direct Costs (ODC)

Projection Name: Sanyo Site

Projection Type: Initial

Date: 11/12/98

Description	Ctr. Code	Vend Code	Cost Type	Unit Cost	Units	Qty	Task Code	Task Description	Projected Cost	Total Cost
Amerritech	ETI5		Subctr/Consultant	800.00	Bulk	1.0	06	Administrative	840	840
Clean Fill	ETI5		Disposal	25.00	Tons	15000.0	03	Disposal	393750	393750
Copiers/fax	ETI5		Materials/Supplies	300.00	Each	2.0	06	Administrative	630	630
Diesel for Equip	ETI5		Fuel	1.09	Gal	1500.0	06	Administrative	1717	1717
Electrical	ETI5		Utilities	500.00	Bulk	1.0	06	Administrative	525	525
Fuel for vehicles	ETI5		Transportation	1.09	Gal	1200.0	06	Administrative	1373	1373
Lodging	ETI5		Lodging	13104.00	Bulk	1.0	06	Administrative	13759	13759
Low Level Rad Waste	ETI5	0001	Disposal	550.00	Tons	13000.0	03	Disposal	7507500	7507500
Office material	ETI5		Materials/Supplies	450.00	Bulk	1.0	06	Administrative	473	473
Office Trailer	ETI5		Equipment	300.00	Bulk	1.0	06	Administrative	315	315
Perdiem	ETI5		Perdiem	7560.00	Bulk	1.0	06	Administrative	7938	7938
Port a john	ETI5		Subctr/Consultant	250.00	Bulk	2.0	06	Administrative	525	525
PPE/DAY/Persor	ETI5		Personal Protection	85.00	Each	140.0	06	Administrative	12495	12495
Visqueen	ETI5		Materials/Supplies	100.00	Bulk	20.0	06	Administrative	2100	2100
								(ODC Totals:)	7,943,940	7,943,940
								(Including Contractor Contingency:15.00%)		9,135,531
								(Including Site Contingency:15.00%)		10,327,122

Contractor
Personnel by CLIN

Projection Name: Sanyo Site
Projection Type: Initial

Date: 11/12/98

CLIN	Job Description	Ctr. Code	Regular Hrs/Day	O.T. Hrs/Day	Regular Rate	O.T. Rate	Qty	No. of Days	Task Code	Task Description	Projected Cost	Total Cost
S1-05-01	Response Manager	ETI5	8.0	2.0	41.00	41.00	1	28	06	Administrative	11480	11480
S1-10-01	Foreman	ETI5	8.0	2.0	28.00	42.00	1	28	06	Administrative	8624	8624
S2-03-01	Clean-Up Technician	ETI5	8.0	2.0	20.00	30.00	3	28	06	Administrative	18480	18480
S2-05-01	Equipment Operator	ETI5	8.0	2.0	30.00	45.00	3	28	06	Administrative	27720	27720
S2-13-01	Field Cost Admin.	ETI5	8.0	2.0	32.00	48.00	1	28	06	Administrative	9856	9856
										(Personnel Totals:)	76,160	76,160
										(Including Contractor Contingency:15.00%)		87,584
										(Including Site Contingency:15.00%)		99,008

Cost Summary

Projection Name: Sanyo 2 ERRS
Projection Type: Initial

Date: 11/12/98
Prime Contractor: ETI5

		Projection	Archive	Total
CONTRACTOR				
	Personnel Cost	19350	0	19350
	Equipment Cost	31575	0	31575
	Other Direct Cost	69253	0	69253
	Total for Contractor	120178	0	120178
	Contractor Contingency:15.00%			18027
	Including Contractor Contingency			138205
	Site Contingency:15.00%			18027
	Including Site Contingency			156231
GOVERNMENT				
	Personnel Cost	0	0	0
	Equipment Cost	0	0	0
	Other Direct Cost	0	0	0
	Total for Goverment	0	0	0
	Site Contingency: 15.00%			0
	Including Site Contingency			0
PROJECT TOTAL				156231

Contractor

Personnel by CLIN

Projection Name: Sanyo 2 ERRS

Projection Type: Initial

Date: 11/12/98

CLIN	Job Description	Ctr. Code	Regular Hrs/Day	O.T. Hrs/Day	Regular Rate	O.T. Rate	Qty	No. of Days	Task Code	Task Description	Projected Cost	Total Cost
S1-05-01	Response Manager	ETI5	8.0	2.0	41.00	41.00	1	15	06	Administrative	6150	6150
S2-03-01	Clean-Up Technician	ETI5	8.0	2.0	20.00	30.00	1	15	06	Administrative	3300	3300
S2-05-01	Equipment Operator	ETI5	8.0	2.0	30.00	45.00	2	15	06	Administrative	9900	9900
										(Personnel Totals:)	19,350	19,350
										(Including Contractor Contingency:15.00%)		22,253
										(Including Site Contingency:15.00%)		25,155

Contractor

Other Direct Costs (ODC)

Projection Name: Sanyo 2 ERRS

Projection Type: Initial

Date: 11/12/98

Description	Ctr. Code	Vend Code	Cost Type	Unit Cost	Units	Qty	Task Code	Task Description	Projected Cost	Total Cost
Clean fill(Clay cap)	ETI5		Materials/Supplies	50.00	Yd3	1200.0	06	Administrative	63000	63000
Diesel Fuel	ETI5		Fuel	1.09	Gal	750.0	06	Administrative	858	858
Fuel for vehicles	ETI5		Fuel	1.09	Gal	200.0	06	Administrative	229	229
Lodging	ETI5		Lodging	1800.00	Bulk	1.0	06	Administrative	1890	1890
Perdiem	ETI5		Perdiem	3120.00	Bulk	1.0	06	Administrative	3276	3276
								ODC Totals:)	69,253	69,253
								(Including Contractor Contingency:15.00%)		79,641
								(Including Site Contingency:15.00%)		90,029

Contractor

Equipment by CLIN

Projection Name: Sanyo 2 ERRS

Projection Type: Initial

Date: 11/12/98

CLIN	Equipment Description	Ctr. Code	Hrs/ Days	Qty	Reg Days	Mob Days	Stby Days	Decon Days	Task Code	Task Description	Projected Cost	Total Cost
10910	Car-Passenger	ETI5	10.0	1	15	0	0	0	06	Administrative	675	675
13610	Pickup-2 wheel drive	ETI5	10.0	1	15	0	0	0	06	Administrative	900	900
31060	Bulldozer-CAT D8	ETI5	10.0	1	15	0	0	0	06	Administrative	18000	18000
35560	Loader/Track-CAT 973	3 cy ETI5	10.0	1	15	0	0	0	06	Administrative	12000	12000
										(Equipment Totals:)	31,575	31,575
										(Including Contractor Contingency:15.00%)		36,311
										(Including Site Contingency:15.00%)		41,048

Cost Summary

Projection Name: Sanyo 3 ERRS
Projection Type: Initial

Date: 11/12/98
Prime Contractor: ETI5

		Projection	Archive	Total
CONTRACTOR				
	Personnel Cost	2460	0	2460
	Equipment Cost	675	0	675
	Other Direct Cost	63631	0	63631
	Total for Contractor	66766	0	66766
	Contractor Contingency:15.00%			10015
	Including Contractor Contingency			76781
	Site Contingency:15.00%			10015
	Including Site Contingency			86796
GOVERNMENT				
	Personnel Cost	0	0	0
	Equipment Cost	0	0	0
	Other Direct Cost	0	0	0
	Total for Goverment	0	0	0
	Site Contingency: 15.00%			0
	Including Site Contingency			0
PROJECT TOTAL				86795

Contractor

Personnel by CLIN

Projection Name: Sanyo 3 ERRS

Projection Type: Initial

Date: 11/12/98

CLIN	Job Description	Ctr. Code	Regular Hrs/Day	O.T. Hrs/Day	Regular Rate	O.T. Rate	Qty	No. of Days	Task Code	Task Description	Projected Cost	Total Cost
31-05-01	Response Manager	ETIS	8.0	2.0	41.00	41.00	1	6	06	Administrative	2460	2460
										(Personnel Totals:)	2,460	2,460
										(Including Contractor Contingency:15.00%)		2,829
										(Including Site Contingency:15.00%)		3,198

Contractor

Other Direct Costs (ODC)

Projection Name: Sanyo 3 ERRS

Projection Type: Initial

Date: 11/12/98

Description	Ctr. Code	Vend Code	Cost Type	Unit Cost	Units	Qty	Task Code	Task Description	Projected Cost	Total Cost
Fencing	ETI5		Materials/Supplies	60.00	Feet	1000.0	06	Administrative	63000	63000
Fuel for vehicles	ETI5		Fuel	1.09	Gal	100.0	06	Administrative	114	114
Lodging	ETI5		Lodging	180.00	Bulk	1.0	06	Administrative	189	189
Perdiem	ETI5		Perdiem	312.00	Bulk	1.0	06	Administrative	328	328
								(ODC Totals:)	63,631	63,631
								(Including Contractor Contingency:15.00%)		73,176
								(Including Site Contingency:15.00%)		82,720

Contractor

Equipment by CLIN

Projection Name: Sanyo 3 ERRS

Projection Type: Initial

Date: 11/12/98

CLIN	Equipment Description	Ctr. Code	Hrs/ Days	Qty	Reg Days	Mob Days	Stby Days	Decon Days	Task Code	Task Description	Projected Cost	Total Cost
10910	Car-Passenger	ETI5	10.0	1	15	0	0	0	06	Administrative	675	675
										(Equipment Totals:)	675	675
										(Including Contractor Contingency:15.00%)		776
										(Including Site Contingency:15.00%)		878

Cost Summary

Projection Name: Sanyo Site Govt
Projection Type: Initial

Date: 11/12/98
Prime Contractor:

		Projection	Archive	Total
CONTRACTOR				
	Personnel Cost	0	0	0
	Equipment Cost	0	0	0
	Other Direct Cost	0	0	0
	Total for Contractor	0	0	0
	Contractor Contingency:15.00%			0
	Including Contractor Contingency			0
	Site Contingency:15.00%			0
	Including Site Contingency			0
GOVERNMENT				
	Personnel Cost	32025	0	32025
	Equipment Cost	0	0	0
	Other Direct Cost	14406	0	14406
	Total for Goverment	46431	0	46431
	Site Contingency: 15.00%			6965
	Including Site Contingency			53396
PROJECT TOTAL				53396

Government

Personnel by CLIN

Projection Name: Sanyo Site Govt

Projection Type: Initial

Date: 11/12/98

CLIN	Job Description	Ctr. Code	Regular Hrs/Day	O.T. Hrs/Day	Regular Rate	O.T. Rate	Qty	No. of Days	Task Code	Task Description	Projected Cost	Total Cost
S1-05-01	On Scene Coordinator	EPA	8.0	2.0	30.00	30.00	1	21	0601	Administrative / O	17325	17325
S1-05-01	On Scene Coordinator	EPA	8.0	2.0	35.00	0.00	1	21	0601	Administrative / O	7350	7350
S4-17-01	Engineer/Environment	TAT	8.0	2.0	35.00	0.00	1	21	0601	Administrative / O	7350	7350
										(Personnel Totals:)	32,025	32,025
										(Including Site Contingency:15.00%)		36,829

Government

Other Direct Costs (ODC)

Projection Name: Sanyo Site Govt Date: 11/12/98

Projection Type: Initial

Description	Ctr. Code	Vend Code	Cost Type	Unit Cost	Units	Qty	Task Code	Task Description	Projected Cost	Total Cost
Film			Materials/Supplies	10.00	Roll	30.0	0601	Administrative / Oversig	300	300
Gasoline			Fuel	1.09	Gal	300.0	0601	Administrative / Oversig	327	327
Gasoline			Fuel	1.09	Gal	300.0	0601	Administrative / Oversig	327	327
Liquid Nitrogen	TAT		Materials/Supplies	3.00	Gal	500.0	0601	Administrative / Oversig	1500	1500
Lodging	EPA		Travel	52.00	Each	28.0	0601	Administrative / Oversig	1456	1456
Lodging	EPA		Lodging	1050.00	Bulk	1.0	0601	Administrative / Oversig	1050	1050
Lodging	TAT		Travel	52.00	Each	28.0	0601	Administrative / Oversig	1456	1456
Lodging	TAT		Lodging	1050.00	Bulk	1.0	0601	Administrative / Oversig	1050	1050
Perdiem	EPA		Travel	30.00	Each	28.0	0601	Administrative / Oversig	840	840
Perdiem	EPA		Perdiem	630.00	Bulk	1.0	0601	Administrative / Oversig	630	630
Perdiem	TAT		Travel	30.00	Each	28.0	0601	Administrative / Oversig	840	840
Perdiem	TAT		Perdiem	630.00	Bulk	1.0	0601	Administrative / Oversig	630	630
Soil Samples	EPA		Analysis	100.00	Each	20.0	0601	Administrative / Oversig	2000	2000
Water Samples	EPA		Analysis	100.00	Each	20.0	0601	Administrative / Oversig	2000	2000
								(ODC Totals:)	14,406	14,406
								(Including Site Contingency:15.00%)		16,567

Attachment E

Photodocumentation

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1400
LOCATION: Richmond, Indiana **DIRECTION:** East **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS1-1 and SS1-2 were collected from the northeast corner of the site at sample location SS1.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1425
LOCATION: Richmond, Indiana **DIRECTION:** Northeast **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS2-1 and SS2-2 were collected 50 feet west of sample location SS1.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1428
LOCATION: Richmond, Indiana **DIRECTION:** Northwest **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS3-1 and SS3-2 were collected approximately 200 feet southwest of sample location SS2.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1428
LOCATION: Richmond, Indiana **DIRECTION:** Northwest **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS3-1 and SS3-2 were collected approximately 200 feet southwest of sample location SS2.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1430
LOCATION: Richmond, Indiana **DIRECTION:** West **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS4-1 and SS4-2 were collected approximately 100 feet west of sample location SS3.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1430
LOCATION: Richmond, Indiana **DIRECTION:** West **PHOTOGRAPHER:** R. Bugg
SUBJECT: Sample location SS4.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1440
LOCATION: Richmond, Indiana **DIRECTION:** South **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS5-1 and SS5-2 were collected 100 feet north of the northwest entrance gate.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1450
LOCATION: Richmond, Indiana **DIRECTION:** Southeast **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS6-1 and SS6-2 were collected near the railroad tracks located at the southwest section of the site.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1500
LOCATION: Richmond, Indiana **DIRECTION:** Southeast **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS7-1 and SS7-2 were collected near the 2-story building's side door.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1405
LOCATION: Richmond, Indiana **DIRECTION:** West **PHOTOGRAPHER:** R. Bugg
SUBJECT: Sample location SS8.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1405
LOCATION: Richmond, Indiana **DIRECTION:** Southwest **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS8-1 and SS8-2 were collected on the east side of the facility.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1415
LOCATION: Richmond, Indiana **DIRECTION:** West **PHOTOGRAPHER:** R. Bugg
SUBJECT: Sample location SS9. After digging the holes, many of the sample locations accumulated water.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1415
LOCATION: Richmond, Indiana **DIRECTION:** Northwest **PHOTOGRAPHER:** R. Bugg
SUBJECT: Samples SS9-1 and SS9-2 were collected from the southeast section of the site.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1530
LOCATION: Richmond, Indiana **DIRECTION:** West **PHOTOGRAPHER:** R. Bugg
SUBJECT: Surface water sample SW-1 and sediment sample SED-1 were collected from Springwood Lake.

SITE: Sanyo **DATE:** June 16, 1998 **TIME:** 1407
LOCATION: Richmond, Indiana **DIRECTION:** South **PHOTOGRAPHER:** R. Bugg
SUBJECT: The site is located west of the trees, on top of the ridge.